

# POPULAR SCIENCE

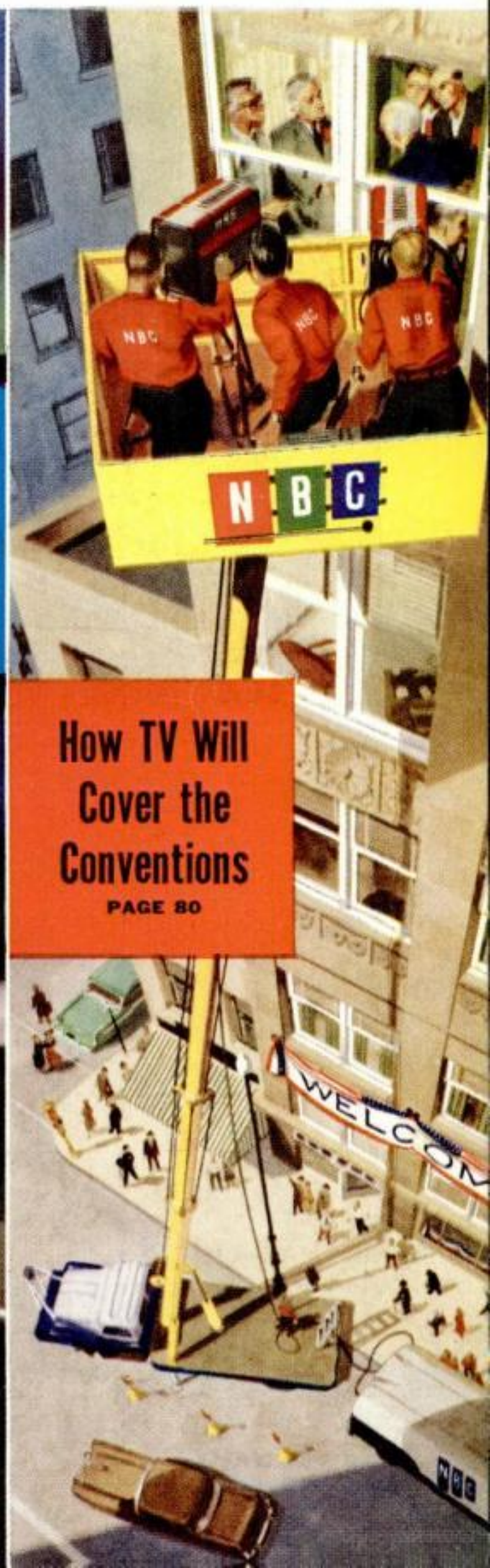
August 35c

MONTHLY



First 1957 Car  
New Cadillac Brougham  
Has Four Headlights

PAGE 65



How TV Will  
Cover the  
Conventions

PAGE 80





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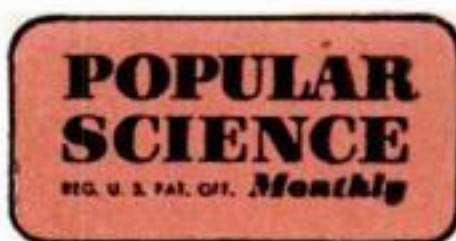
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AUGUST 1956



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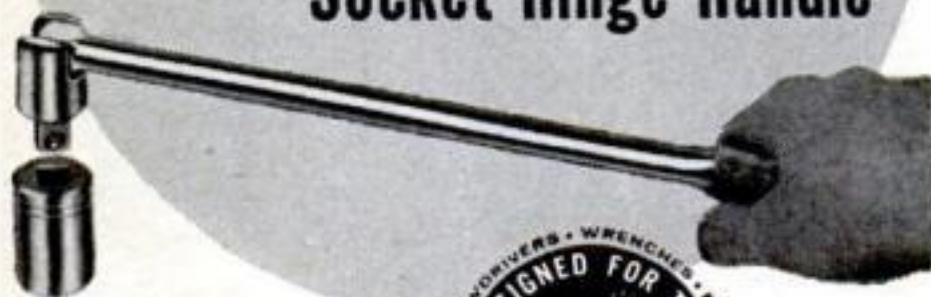
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4 POPULAR SCIENCE

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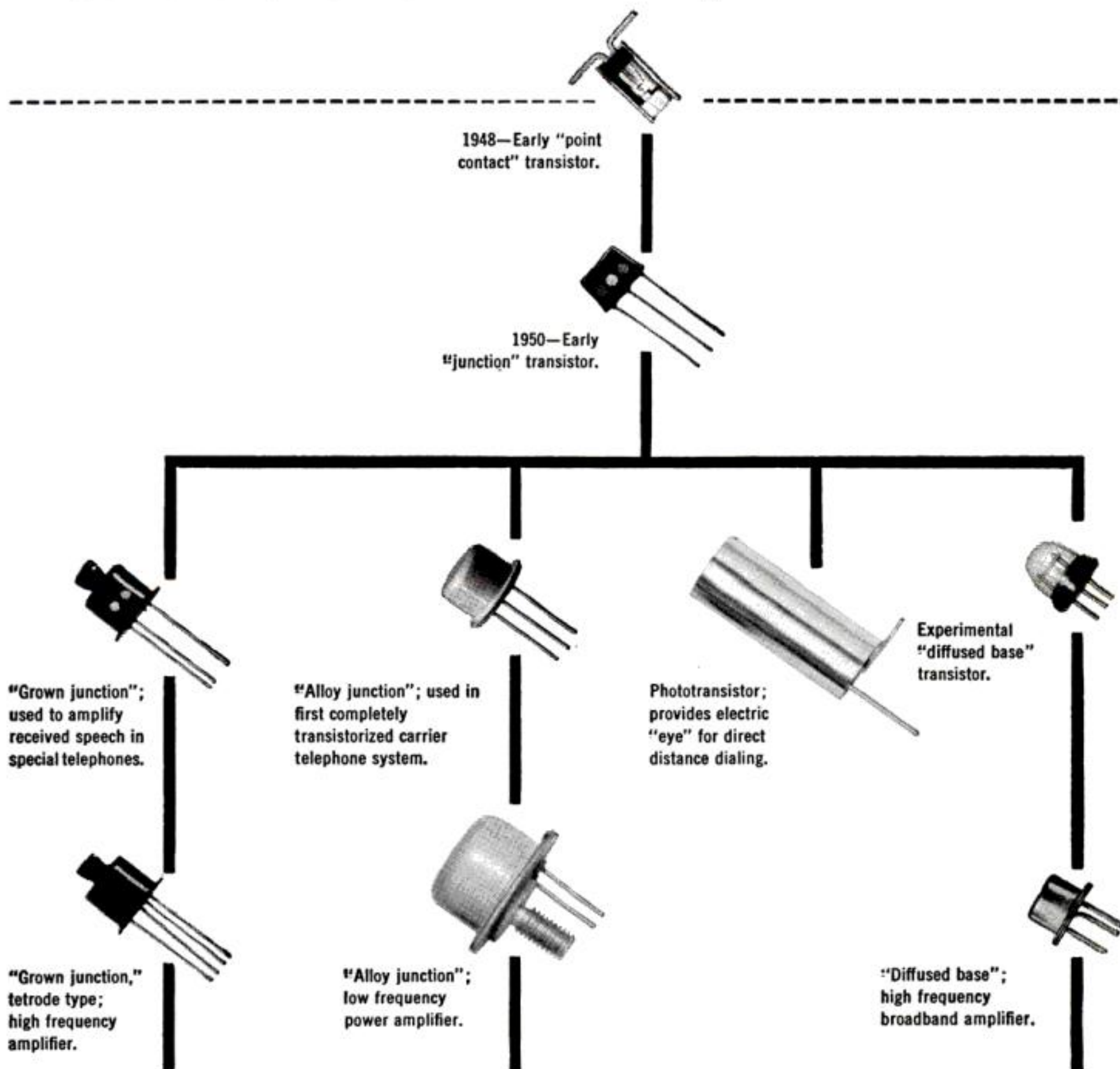
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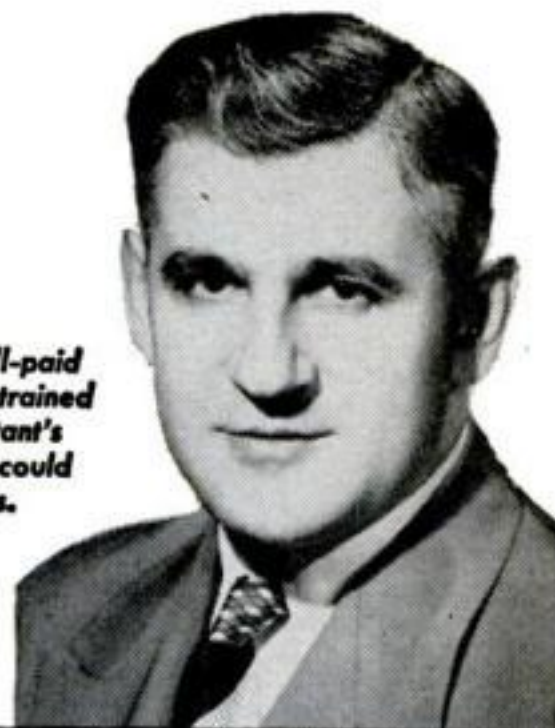
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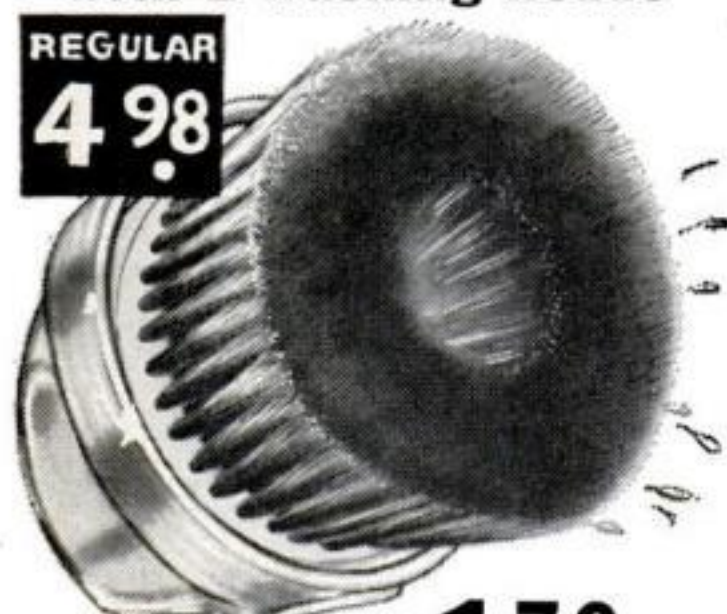
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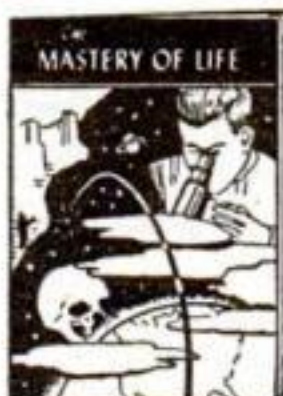
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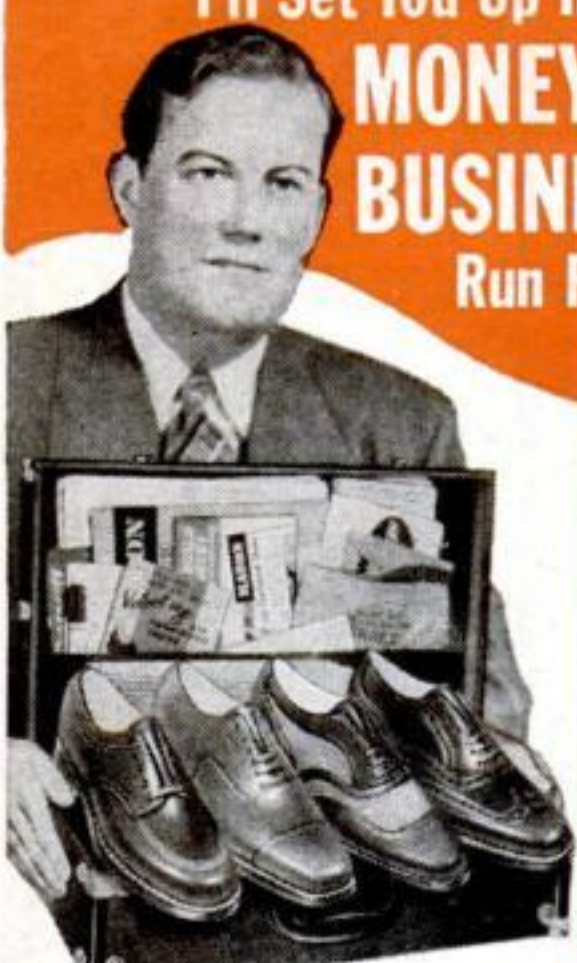
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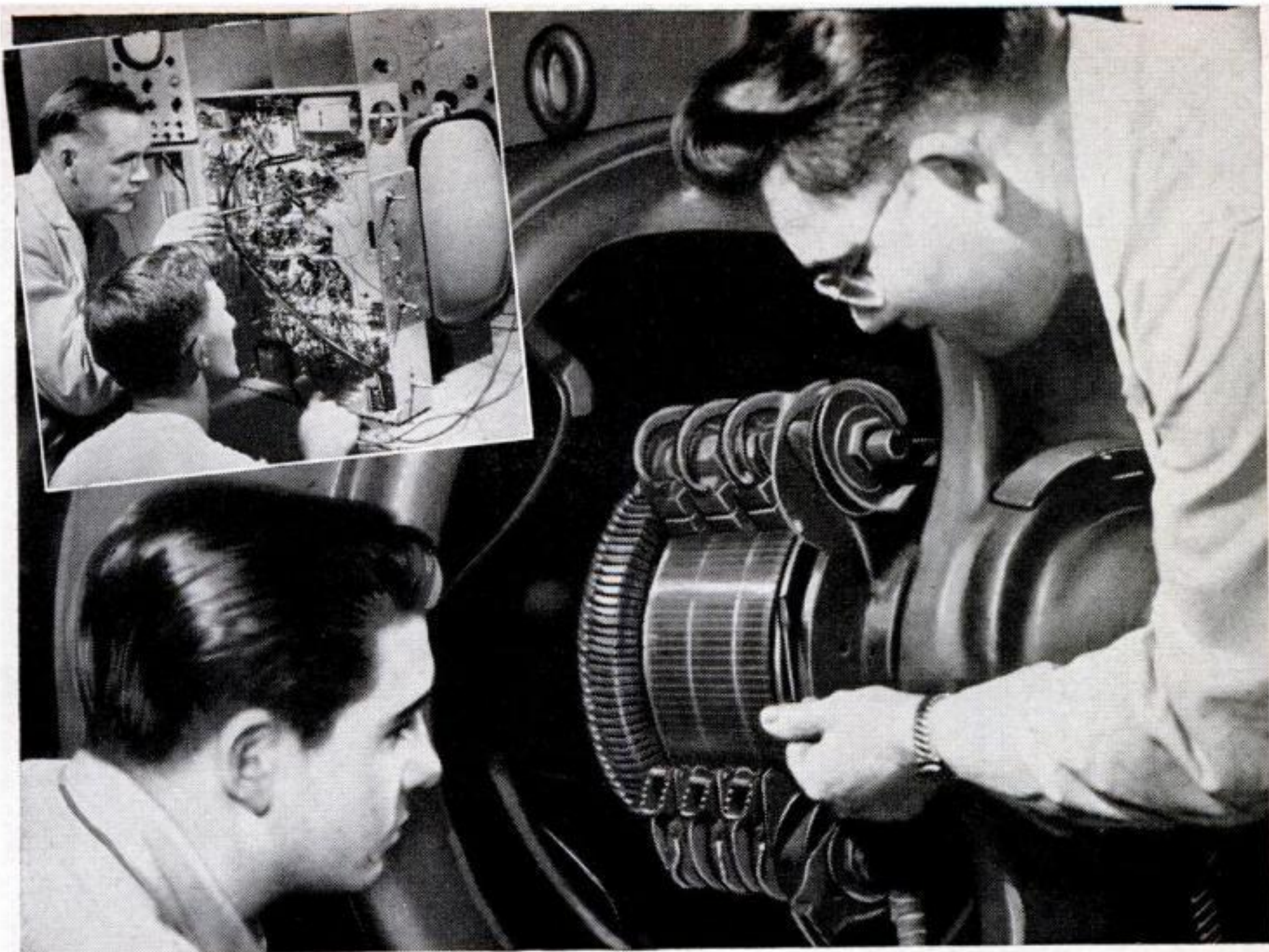
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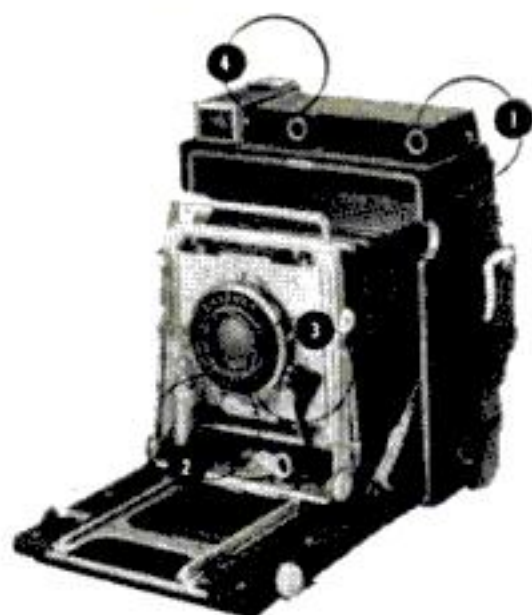
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- ④ Shoe clip for flash.

### ADDS NEW CONVENIENCE

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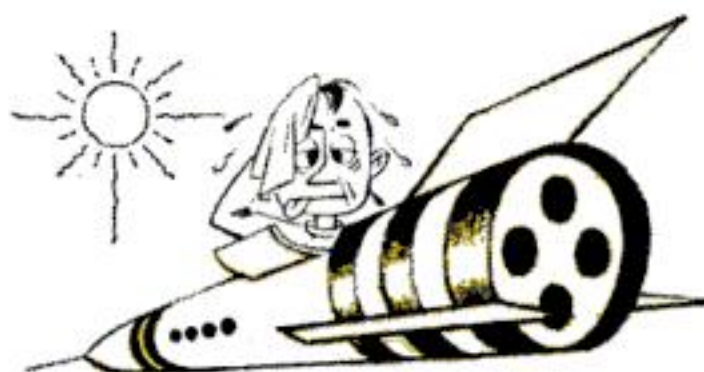
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## Letters

### Colorful Spaceships Get Too Hot

One of my pet peeves is spaceships with stripes, polka dots or any other coloring on them. And that's just what you showed in "Now They're Planning a City in Space" [May, p. 92]. A ship with a bright red nose and tail looks nice, but color absorbs heat from the sun. In space, without 600 or so miles of atmosphere to shield against the direct rays of the sun, the ship is liable to



become very uncomfortable. However, lack of coloring could be a problem, too. It would be quite a job to assemble things in space if the pieces were not clearly identified.

BOB LAMBECK, Manchester, Conn.

*Objects in space absorb heat only on the side facing the sun. And color would be necessary, as Reader Lambeck points out, to make them easily visible and identifiable.*

### PSM Rules Save Gas

I especially liked "Is Your Right Foot Costing You Money?" [May, p. 105]. I followed the rules in the article for a week and did cut my fuel consumption. Thank you very much for a very helpful magazine.

CARLOS DE PAZ JR., Miami

### Who Pays for Roads?

You devoted a considerable portion of the May issue to the world's biggest socialistic endeavor—the new Federal highway system. ["U. S. Plans 40,000-Mile 'Road to Everywhere,'" p. 140]. No mention was made of what proportion of the money needed would come from non-motorists.

A large portion of the present highway use is due to the fact that highway users



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**L**earn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection, in order to safeguard his rights.

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AUGUST 1956 15



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are not called upon to pay their own way. The surest way to eliminate highway congestion is to place all highway costs (including a local property tax on highway land) squarely where they belong—leaving the non-driver out of it.

The most nonsensical of all the material was the allusion to highways as a means of getting into and out of cities. Surely there are better ways to get workers to and from



jobs than by automobile! The diversion of mass transit loads from public transit to highways is the root of the metropolitan problem today. Autos are the cause of enormous expense to cities, and are the basis for death, injury, damage, and smog problems that cannot continue to be tolerated.

HOBART L. JAMIESON, Sharonville, Ohio

The U. S. Bureau of Public Roads reports these statistics on highway funds for 1953—the latest available.

- Collected directly from highway users (gasoline taxes, registration fees, tolls, etc.)—\$3,421 million.
- Spent on state highways—\$2,861 million.
- Spent on all roads (highways, local streets, state police, park roads, etc.)—\$5,536 million.

### How to Check Squareness with a Mike

As any machinist could tell you, your idea for checking work for squareness by measuring diagonals [New Shop Ideas, May, p. 222] is correct in theory but cannot be done in practice. The 90-degree corners always have burrs on them and the dimensions of the burrs will vary.

The only way this principle can be applied is to put the work into precision V blocks, so that the burrs are bridged, and then mike the diagonals.

ROBERT S. WOODBURY  
Massachusetts Institute of Technology,  
Cambridge, Mass.

It is a mathematical principle that equal



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If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

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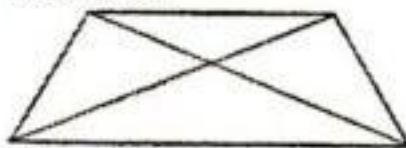
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diagonals prove squareness only if one of the corners has already been proved to be a 90-degree angle. A trapezoid, for instance, may have equal diagonals while none of its corners are 90-degree angles.

GRIFF L. JONES, Librarian  
Kensington High School for Girls,  
Philadelphia

#### TRAPEZOID



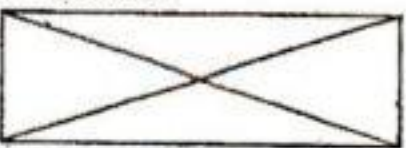
*Diagonals equal  
Opposite sides not equal*

#### PARALLELOGRAM



*Diagonals not equal  
Opposite sides equal*

#### RECTANGLE



*Diagonals equal  
Opposite sides equal*

*Reader Jones is quite right about the trapezoid (see sketch). But it is not necessary to have a proved 90-degree corner. You can check squareness with a micrometer alone: First mike opposite sides; if they are equal you rule out a trapezoid. Then mike the diagonals; if they are equal a parallelogram is out—so you must have 90-degree corners.*

#### Gas Engines Belong Outdoors

Your photo of the emergency generating unit powering home appliances while the electricity was off [May, p. 162] shows a *real* emergency—for the hospital and perhaps the undertaker. This is a gasoline-driven unit. Running it in the living room, as shown, you'd be asphyxiated by the carbon-monoxide exhaust.

STEVE CONKOVICH, Houston, Tex.

*This serious flaw was spotted by a number of readers. We unwisely used a picture made by an overzealous photographer.*

#### Will It Be Pay TV or None?

I have one question about your article on toll television ["Pay TV?" Oct. '55, p. 142] which has just reached my hands. If pay TV comes into being, will my screen be dark for the local shows that I am completely satisfied with at the present? If I don't pay those robbers for using my own TV, will I have NOTHING except a blank screen?

Thanks for running the article, certainly enjoyed it.

M/SGT. ROBERT J. UNRUH,  
APO 172, Postmaster, N. Y.

*The proponents of pay TV say no, the new system would simply supplement the*



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1005

D T I's Training is Available in Canada



present free programs. The opponents of pay TV disagree, claiming that pay television would drive free shows off the air.

### The Dope on Printed Circuits

Could you give some information about these printed circuits that are now being used in some TV sets? I am thinking of buying a set that contains printed circuits, and I'd like to know more about them.

I have been told they are difficult to serv-



ice. A dealer and a repairman that I asked about them were not very enthusiastic.

J. W. BEHN, Brockton, Mass.

*Printed circuits are sections of TV receivers (or radios or whatever) that do not have ordinary wires. The electricity is carried by thin ribbons of metal which are printed or etched on plastic "boards." They are cheaper to make.*

*They are very sturdy and are less likely to need repair than ordinary wiring. When necessary, minor repairs can be made by a skilled serviceman. Major repairs are easy—but expensive: you throw away the defective board and install a new one.*

### Surprise: Owner Likes Continental!

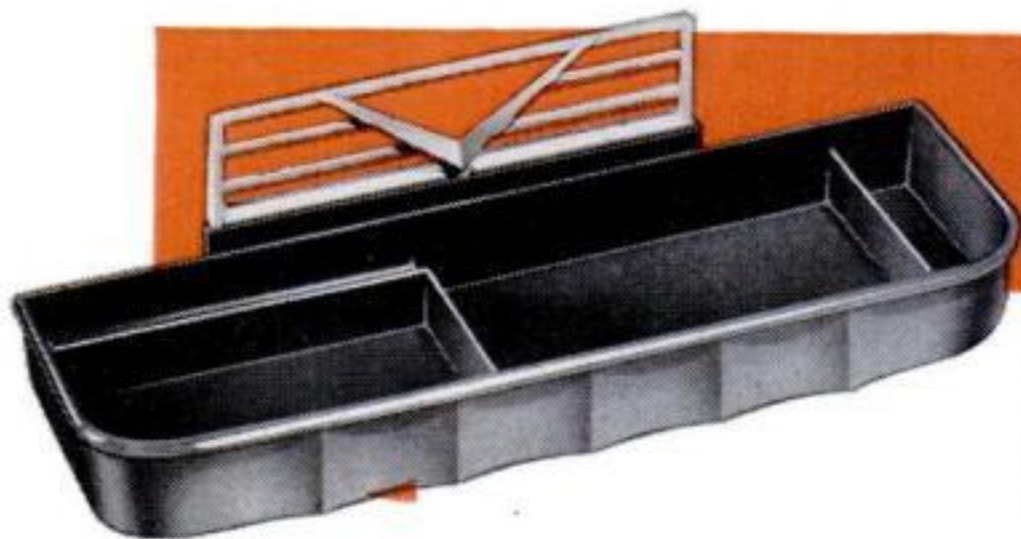
You may be interested in gasoline-mileage tests I have made with my Mark II Continental. While the car was still very new, I made a 1,000-mile trip, and averaged 14½ miles per gallon, despite the fact that the car was very stiff, all parts being fitted to close tolerance.

Later on, when the car had covered about 2,000 miles, I made a second test. It showed an average of 15 miles per gallon. During this run, average speed was about 60, but we did get up to 90 miles per hour, at all times with safety and control.

The smoothness of the operation of this car I have never before experienced, and I have driven for over 50 years.

WALTER SCOTT HILL, Sarasota, Fla.

*For more about the Mark II Continental, see page 100.*



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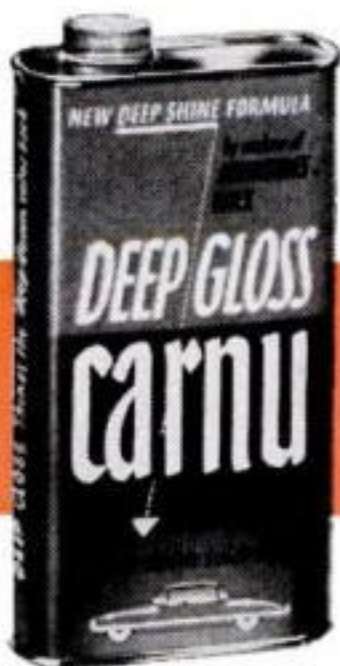
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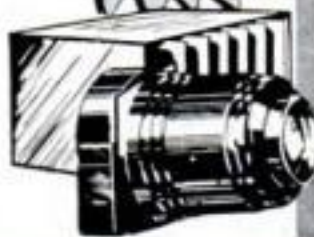
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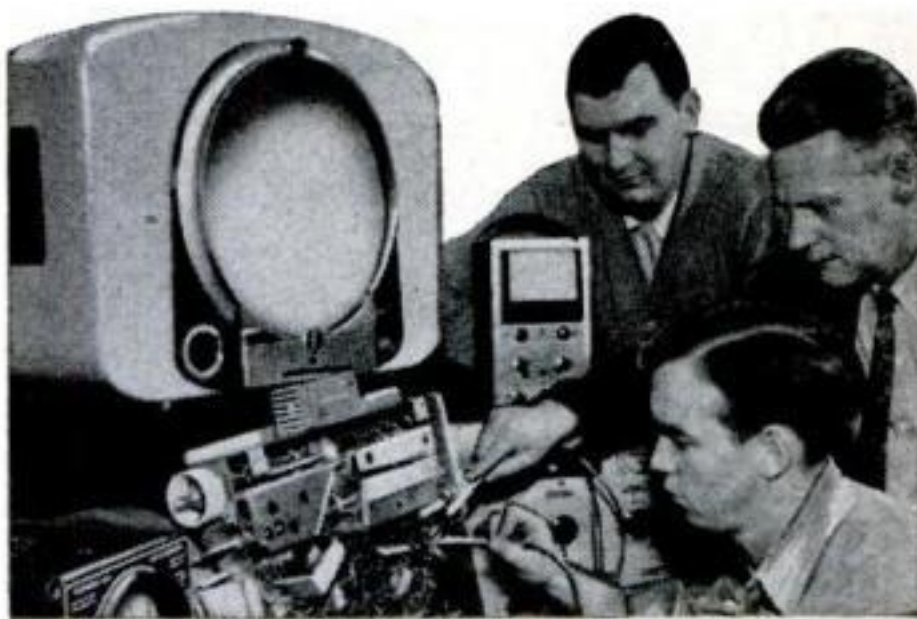
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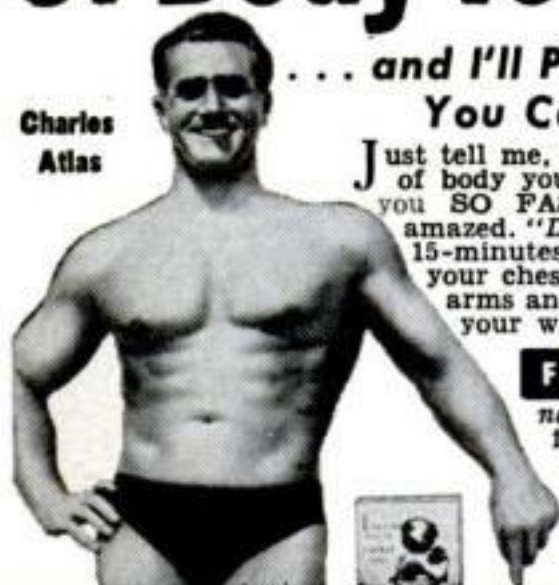
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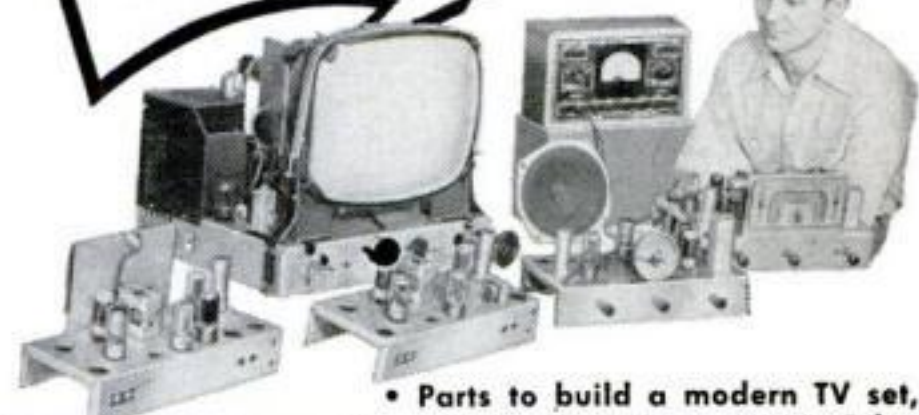
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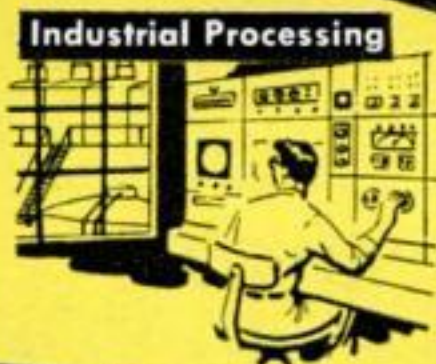
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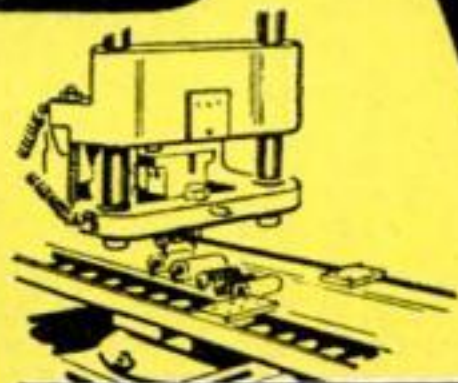
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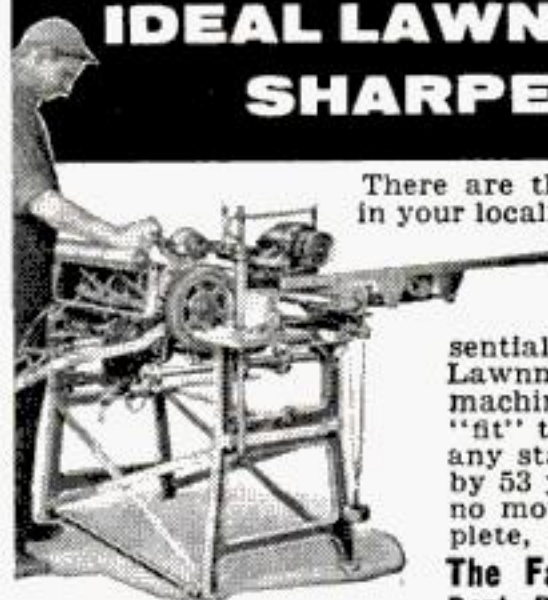
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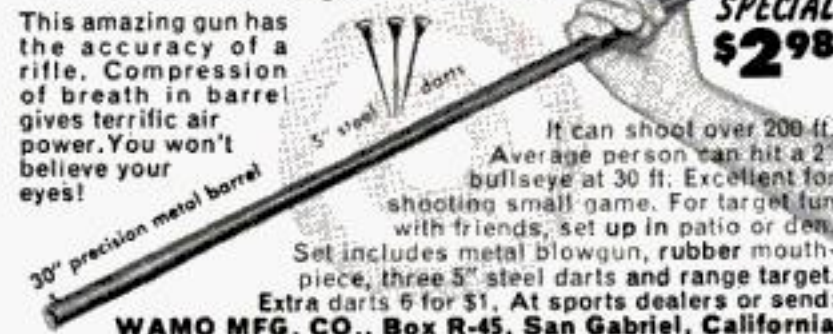
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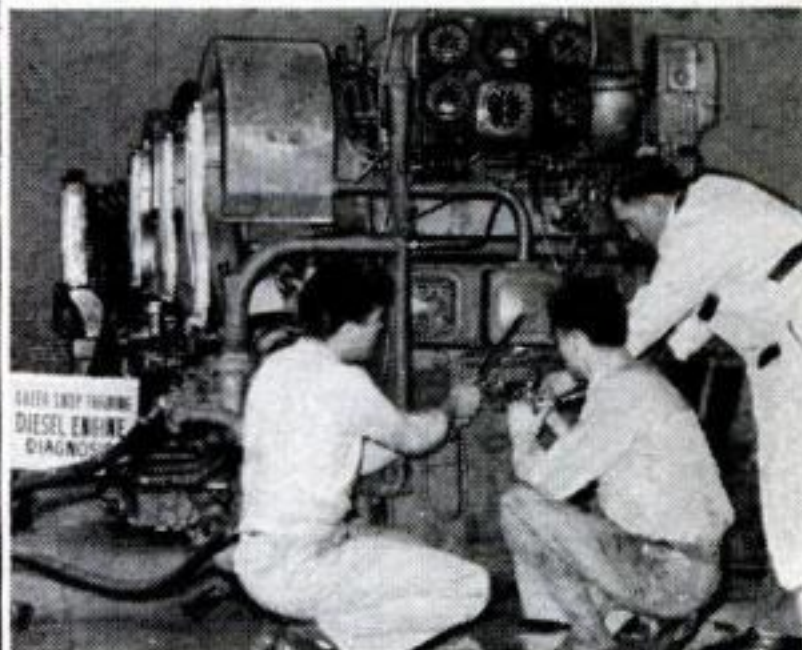
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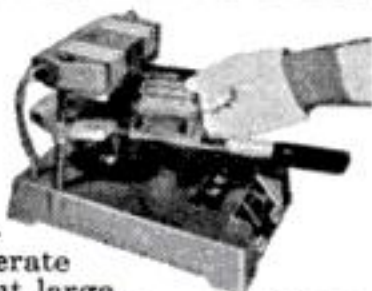
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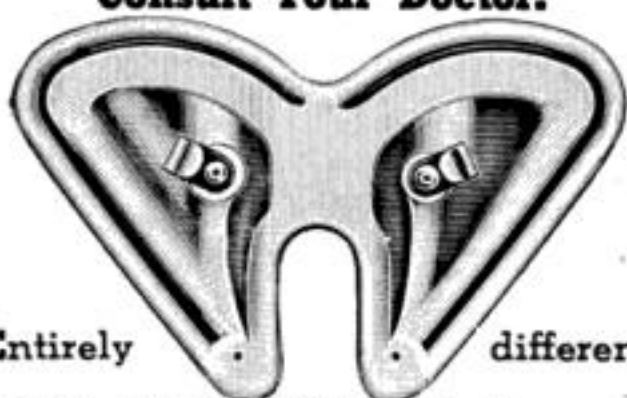
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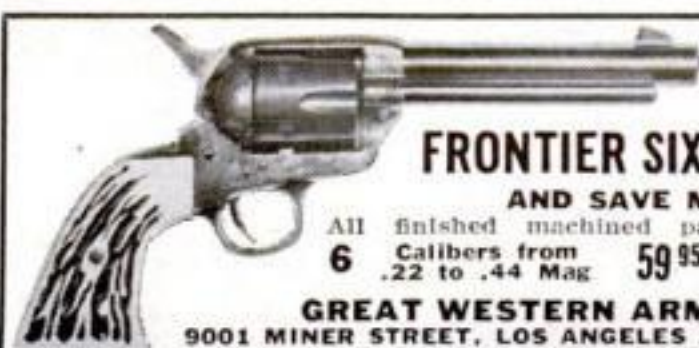


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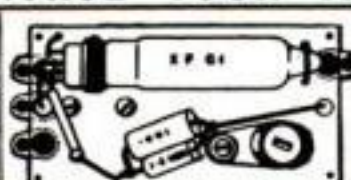
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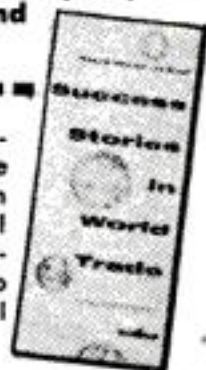
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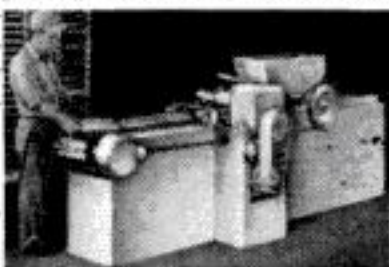


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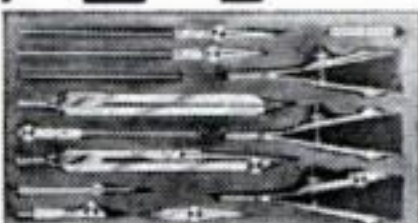
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JEOP Owners—V-8 Power, Read Jeep Owners ad. Page 233.

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**\$1,000 MONTHLY** possible in collection agency business. Free details. Write Cole Associates, Syracuse 2, New York.

**BRUSH** Plating Outfits for plating articles in the home and shop. No tanks necessary. Good income spare or full time. Free particulars. Gunmetal Co., Ave., E. Decatur, Illinois.

**\$70 WEEKLY**—Home, spare time. Simplified mail bookkeeping. Immediate income—easy! Auditax, 34757D, Los Angeles 34.

**YOU** can Make Money at home in spare time taking magazine renewal subscriptions. No capital or experience necessary. All supplies furnished. Write Today! McGregor Magazine Agency, Dept. 510B, Mount Morris, Illinois.

**MINK** Raising information free. Complete. Lake Superior Mink Farm, Superior E E5, Wisconsin.

**RARE** opportunity for men in country and small towns. New company with Proved Plans that make you bigger profits. Write "Fire King," Dept. 23, Littleton, Colorado.

**LIQUID** Rubber. Make flexible molds. Free Sample. Chaney, 1130 E. 16th St., Jacksonville 6, Fla.

**LEARN** Real Estate by Listening to Records, Lee Institute, Brookline 47, Massachusetts.

**BECOME** Tax Consultant. Graduates earn \$3,000 every tax season preparing returns evenings. State approved. Union Institute, 68 Hudson, Hoboken 12, N. J.

**WORK** at home—Sensational new plans for beginners. Free details. Shields, Box 164S, Miami 38, Florida.

**MAKE** Profitable Products—Sell Mailorder—Catalogue free. International, 6347 Parnell, PS8, Chicago 21, Illinois.

**WHOLESALE** Catalog!! 30-80% Discounts! Appliances, Musical Instruments, Typewriters, Tools, Watches, Jewelry, Cameras, Housewares, etc. Consolidated Distributors, 7-15 Henry, Paterson 15, N.J.

**EARN** to \$90.00 and more weekly sparetime. Mailorder operated—this business works. Beginners test proves profits. Information and plan free. Barriskill, 2131 University, Berkeley 4, California.

**SELL** most attractive, reasonably priced Bouncing horse on market, finished four beautiful colors. Attractive discounts. Retail thirteen dollars. Sample seven dollars. Write for particulars. Adrain's Toys, Inc., Box 1101, Mobile, Alabama.

**FREE** Bulletin—\$6000-\$60,000; Unknown Self Working Family Security Plan. No equipment, Merchandise. Sound! No risk! Unlimited possibilities! Baugh-PS, 1514 "F" Street, Sacramento, California.

**GROW** Mushrooms. Cellar, shed, Spare, full time, year round. We pay \$3.50 lb. We Paid John Betts \$7,977.76, he started as amateur. Free Book. Mushrooms, Dept. 178, 2954 Admiral Way, Seattle, Washington.

**POPCORN** and Potato Chip Equipment. Eakins, Box 933-B6, Springfield, Ohio.

**IMPORT** your own products in small lots. Also, start profitable mail order business using International Dropshipment method. Capital unnecessary. Free details. Ga. Overseas Trading Co., Dept. D.3, 715 Persons Bldg., Macon, Georgia.

**TO** \$100.00 weekly. Sparetime, home operated mailorder business. Successful "Beginner's" plan. Everything supplied. Lynn, 10420-C National, Los Angeles 34.

**OPPORTUNITY** to earn \$15,000-\$30,000 annually. Franchise protected. Granted on \$12,500 guarantee Live at home. No merchandise to buy. Selfemployed. One of most exclusive and noncompetitive Businesses in United States and Canada. Send for free explanatory booklet. Harrell and Company, Box 8-D, Louisville, Illinois.

**BIG** Profits Raising Fishworms and Crickets. Free Literature. Carter Worm Company, Plains, Georgia.

**SAVE** 20% to 50%. Buy wholesale! Nationally advertised merchandise. Free details! Beecher Sales, Box 2161-E, Cincinnati 1, Ohio.

**"MAILORDER** Laws and Regulations". Discusses federal, state, local licenses, necessary taxes, legal requirements governing mailorder businesses. \$1.00. "Mailorder Rules for Beginners" Additional helpful information. \$1.00. Play Safe. Order both. Tasker, 105 East Custis, Alexandria, Virginia.

**MAKE** flexible molds. Cast figurines, plaques. Free sample. Tooker, 630-A Chestnut, Hamilton, Ohio.

**11,000** NEW Prospects Daily. Baby record books, shoes, albums. Sell mailorder. Everything furnished. Free literature. No-Co-Ro, Capitola, California.

**\$250** WEEK cleaning venetian blinds. Patented Machinery. Free literature. Robinson, 7213A, Indianapolis 1, Indiana.

**IMPORT-Export** Opportunities. Terrific profits, little capital needed. Lists of foreign and domestic manufacturers and exporters. Mail Order laws and regulations, instructions, complete \$1.00. Details stamp. Will Riet Company, 107 E. Ilford Avenue, North Arlington, New Jersey.



# POPULAR SCIENCE OPPORTUNITIES

"I EARN \$400.00 a week." I've learned an amazing new method of printing, colorful signs, banners, cards, posters, glassware—anything. No printing press or other expensive equipment is necessary! Big Money-Making opportunity for anyone. Write for my secret and Revealing home-business plan—you'll be amazed! Mr. Anderson, Screen Print Company, PS-8, Los Angeles 61, California.

MAKE Big Money cleaning, servicing, repairing grocery carts. Instructions \$1.00. Send to—F. Mitchell, 3325 E. Michigan, Fresno, California.

"HOW to Start a Business" booklet sent Free! If you know any Trade—go into business for yourself! Learn the 9 easy steps to follow. We've guided 5,000 others to success. Revealing Free Booklet yours for the asking! Write! National Business Consultants, Office AT, Los Angeles 61, California.

DOUBLE Your Business with inexpensive Newspaper Classifieds! Details free. Simon, Box 87-PS1, Pelham, New York.

SELL By Mail. Unlimited Earnings. Write Scewe, 121-H Sanford, Brooklyn 5, New York.

VENDING machines—every description. New or used. Lowest prices. Start a route or sell outright. Mack Postel, 2952 Milwaukee, Chicago 18.

OPERATE restaurant or diner. Free booklet reveals plan. Write Restaurant Arts, BU-48, Fremont, Ohio.

POWER Mowers. 2½-hp. 4-cycle, 20" cut \$57.00. Sensation. Farmco-2, Excelsior Springs, Missouri.

FREE Samples. "Dancing" Elephants. Mules. Windshield mounted. Smith Agency-52, Excelsior Springs, Missouri.

60% PROFIT Cosmetics. \$25 Day Up. Hire others. Samples, details. Studio Girl Hollywood, Glendale, California. Dept. 1168H.

ADVERTISING book matches—Cash in on big demand—sell Union Label matches. Cuts for all businesses and political parties—Free powerhouse selling kit—low prices—protection guaranteed on repeat orders—Cash Commissions. Superior Match Co., Dept. PX-856, 7530 Greenwood, Chicago.

FREE Folio "\$5,000-\$45,000; Unlimited Vacations." No merchandise, equipment. Unknown! Work home—sparetime! Haylings—S-16, Carlsbad, Calif.

CASH from Sawdust (seventy methods). Tin-cans (thirty methods). Newspapers (eighteen methods). Instructions 50c each. All three \$1.00. Charles Company, 12-EXV, Norwood, Ohio.

SPARETIME home operated mailorder business. Successful beginners plan. Everything Supplied. Aymes, 4219-Q½, Galveston, Texas.

MONEYMAKING Opportunities! Send 24c; Refundable! Solar, #6336 Metropolitan, Los Angeles 55, California.

A business of your own. Earn \$125.00 a week in your spare time with the Ovenglo Infra-Red Oven. Hot sandwiches in minutes. Write Ovenglo Sales, 4729 North Lincoln, Chicago.

MAKE tough, attractive building plastic, easily, 800% Profit. Exclusive district. Bays Laboratory, Oklahoma City 9.

AMAZING successes through franchises! Become exclusive distributor, agency operator. Nationwide opportunities. Request details. National Franchise Reports, 333 North Michigan, Chicago 1.

\$250 WEEK reported! Free book "505 Odd, Successful Businesses." Work home! Expect something Odd! Pacific-36C, Oceanside, California.

\$26,500 SALES in two weeks! Amazing radio-mail order method. Free details. Broadcast Service, 1412-KS Great Northern Building, Chicago 4, Ill.

AMBITIOUS? We establish you in your own business, supply catalogues, circulars, sales letters etc.; ship orders under your name, paid or C.O.D.; show you exactly what to do. Sell by mail, through agents or personally. Catalog, plans, details absolutely free. Rush postcard to Topval Corp., Lindenhurst 721, New York.

A Monthly repeat business which you can operate in your own community. For the average working man. For free details write Grasek, P.O. Box 494, McKeesport, Pennsylvania.

MAKE Money clipping newspaper items for publishers. Devised plan explains procedure. Write: Newscraft, PS-983-E Main, Columbus 5, Ohio.

"EVERYBODY Likes Candy." Make professionally home. (Our 45th Year.) Ragsdale Candies, East Orange, N. J.

\$1,000-\$2,000 MONTHLY Possible! New, easy-to-start, home Mailorder Business! Everything supplied! Rush card for complete details. Maxson, Falls Church 21, Virginia.

MAKE 80c Profit On Every Dollar Selling Merchandise By Mail. Everything Furnished. Write: Eastern, Box 142-B, Boston 24, Massachusetts.

BUY Wholesale 750,000 Products. Free Details. Carter, Box 6011-E, Chicago 80.

\$10.00 PER hour net profit in monument cleaning business. Free Details. X-Pert Monument Cleaning Company, 466 Potomac Avenue, Buffalo 13, New York.

DISCOUNTS 20-50%, thousands nationally advertised products; own use; sell others at big profits. Postcard brings free information. National Wholesale Service, Dept. M, Box 397, Buffalo 5, New York.

COLORGLAZED Concrete pottery made without molds. Patented method. Cemetery products, novelties, tiles. Basement leak-sealing. Money-making projects. Booklet, details free. Men only. National Potteries, Grand Rapids, "Minnesota."

YOUR address may be worth a fortune, free information. Easy Life, 12906 Estelle Road, Silver Spring, Maryland.

UNUSUAL mail orders ideas, products, projects, sources. Authentic information, guidance. Free details. Write: Fax, Box 1024-A, Galveston, Texas.

NEW mail order method. Details. Chester, Box 865-A, Sea Cliff, New York.

OWN A Collection Agency. Pays big. Franklin Credit, Roanoke 7, Virginia.

SENSATIONAL Money-makers. Advertised \$18.75 costs you 60c. Free Booklet, "Making Money The Easy Way." Essif, 73-14A 175 Street, Flushing 66, New York.

BUY Wholesale direct! Western States. Save 40% freight charges Appliances, Housewares, Tools, Toys, Sporting Goods, Jewelry. Large Catalog \$1.00. Refundable! General Wholesalers, Box 3058F, San Francisco.

IF you have a product or service that can be operated on a mail order basis, write me today. I will send you a Free Kit on "How To Make Money Out Of Classified Advertising". Next issue will be October. Closing date August 23. Hurry—Do it Today! O. K. Kelly, Classified Adv., Mgr., Dept. A8, 353 Fourth Avenue, New York 10, N. Y.

## 38 MONEYMAKING OPPORTUNITIES

START A Buying Service, buy wholesale thousands nationally advertised products. Make big profits selling at sizeable discounts. Postcard brings details. American Buyers', Hertel Station, Buffalo 16-01, N. Y.

MAKE Spare Time Money preparing and mailing sales literature. Adams Surveys, 3513-AS Sunset Blvd., Los Angeles 26, California.

DETECTIVES—Work home—Travel. Experience unnecessary. Detective Particulars free. Write, Wagoner, P-125 West 86th, New York 24.

SELL Titania Gems; far more brilliant than diamonds. Catalog free. Diamonite, 2420-S 77th, Oakland 5, California.

Grow Mushrooms. Cellar, shed. Spare, full time, year round. We pay \$3.50 lb. We Paid John Betts \$7,977.76, he started as amateur. Free Book. Mushrooms, Dept. 179, 2954 Admiral Way, Seattle, Washington.

MAKE Money Writing Short Paragraphs! No tedious study. I tell you what to write, where and how to sell; and supply list of editors buying from beginners. Many small checks add up quickly. Write to sell, right away. Send for free facts. Benson Barrett, Dept. C-86-V, 7464 Clark, Chicago 26.

WRITE for Free information concerning profitable sideline. Philadelphia Chinchilla Exchange, 7202-B York Road, Philadelphia 26, Pennsylvania.

BIG Money selling 100 spools thread 90 colors \$1.00. Make 100% profit. Complete mail order plan including sample \$1.00. Standard, Box 134, Seaford, New York.

YOU can Make Money at home in spare time taking magazine renewal subscriptions. No capital or experience necessary. All supplies furnished. Write today! McGregor Magazine Agency, Dept. 510C, Mount Morris, Illinois.

SELL household items by mail \$200 week possible. Details 25c, refundable. Gryders, Box 187, Barberton, Ohio.

WHOLESALE Catalog!! 30-80% Discounts! Appliances, Musical Instruments, Typewriters, Tools, Watches, Jewelry, Cameras, Housewares, etc. Consolidated Distributors, 7-17 Henry, Paterson 15, N.J.

NEW General, Religious, Comedy 7"x11" Signs—cost 7c, sell 50c. Sample free! Lowy, 812 Broadway, Dept. 937, New York 3.

FREE Bulletin—\$6000-\$60,000; Unknown Self Working Family Security Plan. No equipment, Merchandise. Sound! No risk! Unlimited possibilities! Baugh-PS, 1514 "F" Street, Sacramento, California.

\$150 WEEK—easy! Start home Venetian Blind Laundry. Revealing book free. A. V. Co., 101 S. 44th, Philadelphia 4, Penna.

LEARN Technical Metaphysics and insure your future. Easy, inexpensive correspondence course. Simplest method known. Diploma. Write: Premier College of Technical Metaphysics, 2532 McKenzie St., Vancouver 8, B.C., Canada.

FORTUNE Possible raising fishworms and crickets. Free Information. Carter Farm-11, Plains, Georgia.

MAKE money addressing. Literature free. Flithon, 8007 SE 85, Portland, Oregon.

START Big-Pay business at home in spare time. No experience needed to operate little table-top machine for bronzing baby shoes. Make \$5.46 profit on every pair. Full particulars free. Send postcard to Mason, 1512 Jarvis, Room 88, Chicago 26, Illinois.

MEN—Women! Start Money-Making Plastic Laminating Business at home in spare time. Material that costs 11c brings back \$2.58. No canvassing or selling but mail orders bring in \$20 a day. Write for full particulars Free. Rush name on postcard to Warner, Room 88, 1512 Jarvis, Chicago 26, Illinois.

FORMICA. Textolite. Micarta. \$50.00 a day making countertops. Sample cutaway counter and complete instructions including trade secrets only \$4.00. H&H Supply, Inc., 204 George Street, New Haven 10, Conn.

MEN and women wanted to start home business in spare time with little table-top rubber stamp machine. Easy to earn up to \$9.80 an hour without previous experience. Full particulars Free by mail. Send postcard to Roberts, 1512 Jarvis, Room 88, Chicago 26, Ill.

SELL Yourself—Sell Neighbors. Aluminum Car-Portes-Patio-Covers. Beautiful Baked Enamel Colors—Factory Prices. Write "Bob", Box 10254, Tampa, Florida.

60% PROFIT Cosmetics. \$25 Day Up. Hire others. Samples, details. Studio Girl Hollywood, Glendale, California. Dept. 1168H.

FREE Folio "\$5,000-\$45,000; Unlimited Vacations." No merchandise, equipment. Unknown! Work home—sparetime! Haylings—S16, Carlsbad, Calif.

LOOKING for something informative? Home Work, Mail Order Plans, and Trade Magazine 25c. Warren Company, P.O. Box 11, Glenview, Illinois.

5 NEW full size toy patterns \$1.00. Laverne Miller, Route 2, Belle Center, Ohio.

FREE Book "505 Odd Successful Businesses." Work Home! Expect something Odd! Pacific-35c, Oceanside, Calif.

HOW To Build A Coin Operated Miniature Railroad. Automatic—build it and forget it. Profits successfully proven. Send \$1.00 for simplified Plan Book. RAM-27, 5201 Valletta Way, Sacramento 20, Calif.



# POPULAR SCIENCE OPPORTUNITIES

MAKE \$100.00 weekly mailing catalogs. Cash commissions paid. Products, 2342 Washington, Chicago 12, Illinois.

SNAPSHOTS Wanted. \$10.00-\$1000.00 Paid. Rules 25c. Bell, Box 15, Montrose, B.C., Canada.

WANT To go in business for yourself without capital? We show you how. Start part time your own home. Postcard brings complete details absolutely free. Topval Corp., Lindenhurst 322, New York.

\$1,000-\$10,000 YEARLY Possible, operating home Mailorder Business! Free literature describes splendid money-making ideas, some using just pen—typewriter! Rush stamped, self-addressed envelope today! Zimmerman, 28-S, Schuele, Buffalo 15, New York.

\$1,000 MONTHLY Possible raising Redworms; Large African Nightcrawlers! Backyard, Garage, Basement. Illustrated Booklet explains raising, packing, marketing. 25c postpaid! Ozark Worm Farm-v, Willow Springs, Mo.

OPERATE Profitable mail-order business. National Specialties, 5334 Pedley, Riverside, California.

WE pay cash for homework. No selling. Merco, Box 8032, Nashville 7, Tenn.

SELL Yourself—Sell Neighbors Aluminum Awnings—Beautiful Baked Enamel Colors—All Sizes. Factory Prices! Write "Groff," Box 10254, Tampa, Florida.

MAILORDER! Amazingly successful new item. Everything furnished. Delta, 2139-K Logan, Youngstown 4, Ohio.

BUY Wholesale! Save 66-2/3%! Appliances, Furniture, Jewelry, Toys, Sporting Goods, Tools. Free Catalogs. National Buyers Service, Box 3336FB, San Francisco.

NEED Products? Salesmen? Markets? Details free! Write: Sayer Associates, 1129-B Vermont, Washington 5, D. C.

IF you have a product or service that can be operated on a mail order basis, write me today. I will send you a Free Kit on "How To Make Money Out Of Classified Advertising". Next issue will be October. Closing date August 23. Hurry—Do it Today! O. K. Kelly, Classified Adv., Mgr., Dept. A8, 353 Fourth Avenue, New York 10, N. Y.

## 38A BUY IT WHOLESALE

WHOLESALE Catalog!! 30-80% Discounts! Appliances, Musical Instruments, Typewriters, Tools, Watches, Jewelry, Cameras, Housewares, etc. Consolidated Distributors, 7-25 Henry, Paterson 15, N.J.

WHOLESALE Catalog Household items \$1.00, refundable first order. Harold Mishrell, 1745 High St., Erie, Pennsylvania.

MAILORDER Items, Novelties, Books, Samples 30c. List Free. Persil, 436 N. Y. Ave., Brooklyn 25, New York.

WHOLESALE Catalog! Appliances, cameras, watches. Postcard: Selbyco, Decatur 171, Illinois.

WHOLESALE! Large Catalogue! 25-75% Discounts. Appliances, Housewares, Clothes, Jewelry, etc. \$1.00 Refundable. J. P. Frank Co., 1856 Blue Island Avenue, Chicago 8, Illinois.

NATIONALLY Advertised Appliances, Housewares, Jewelry, Watches, Sporting Goods, etc. Catalog \$2.00, Refundable. Free Gift. Address Consumers Supply, P.O. Box 308, Port Byron, Illinois.

WESTINGHOUSE, Sunbeam, Hamilton-Beach, Presto, DeJur, Underwood, etc. Free shipping. Catalog, \$2.00. Mac Thomson, 2470 Oak Street, Eugene, Oregon.

WHOLESALE! Famous brands. Catalog 25c. Golden Feather Service, 423 1/2 East 7th, Long Beach, California.

## 39 FORMULAS, PLANS, ETC.

FORMULAS—All kinds. Latest products. Literature free. Kemico, Park Ridge 15, Ill.

LARGE formula catalog free. Anything analyzed \$35.00. Western Chemical, Salem, Oregon.

COMPOUND Angles Simplified. Graphic Presentation \$1.00 Postpaid. Soler, 13011 So. Haas, Gardena, California.

ONE Formula \$5.00. List With First Order. Milici-PS-, Whitehead Chemists, Box 434, Ruskin, Florida.

MILLER'S Modern manufacturing formulas make fastest-selling products that get the business and pay! Fifty years supplying the best. Valuable Literature free! Miller, Chemist, 1517-C, Tampa, Florida.

ANY Formula \$3.00. Catalog — Mfg. Treatise 10c. J. Belfort, 192 North Clark, Chicago 1.

## 40 PLASTICS

LEARN Plastics Fabrication For spare time income. Low cost home training now available. Write for free booklet. Interstate Training Service, Dept. D-2, Portland 13, Oregon.

PLEXIGLAS—Cut to size—Clear—Any thickness — Colors — Rods — Tubing. Mc. Clarin Plastics, P. O. Box 168B, Hanover, Pa.

LAMINATING Supplies. Price List Free. Solomson, 46 Cornhill, Boston 8, Mass.

PLEXIGLAS, Fiberglass, Polyester, Acetate. Unique wholesale-retail catalog—15c. Gem-O'-Lite, Box 6868, North Hollywood, California.

PLEXIGLAS, Lucite, Square foot cost, 1/16"—\$1.18; 1/8"—\$1.52; 3/16"—\$1.86; 1/4"—\$2.21; 5/16"—\$3.23; 3/4"—\$4.36. Colors 10% additional. Send 15¢ for postage. Aristocrat Plastics, 23-25 Sussex Ave., Newark, New Jersey.

PLASTIC Repair Kit welds breaks and cracks. Restores original finish. Complete kit \$3.00 Cash, Check, Money Order. Rayther, Box 264, Station B, Toledo, Ohio.

## 41 CHEMISTRY & PHYSICS

HOME laboratory and apparatus kits. Laboratory supplies. Catalog 25c. Established 1931. John H. Winn, 124B West 23rd Street, New York, N. Y.

EXPERIMENTERS: Terrific Bargains catalog—20c. Hagenow Laboratories, 2414 Clarks, Manitowoc, Wisconsin.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology 20c. Tracey Laboratories, Evanston, Illinois.

CHEMICALS and apparatus for industrial, analytical and private laboratories. Catalog 25c. Dept. M-26, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N. Y.

CHEMICALS, Supplies Catalog 25c. (refundable). Laboratory Sales, Box 161-P, Brighton, Mass.

AMAZING New Book of Science. Experiments, Formulas and Catalogue of Laboratory Supplies. Only 25c. National Scientific Co., Dept. PS-8, 500 W. Road, Lombard, Illinois.

## 42 HELP WANTED

FOREIGN Jobs—Latin America, Alaska, Canada, up to \$1500 monthly. Up-to-date 1956 Foreign Service Directory gives complete information; hot list of firms hiring for Military and Civilian Construction, Aircraft, Oil, Exporters—Importers, Mining, \$1.00. How-When-Where to apply. 9th successful year! Global Reports, Box 883-P, Hollywood 23, Calif.

SAN Diego or Los Angeles Sunday Help Wanted ads sent airmail \$1.00. Letters re-mailed San Diego \$2.5. George Perry, 3968 Broadway, San Diego 2, Calif.

HELP Wanted Ads in N.Y., Norfolk and Miami \$1. Classified Ads, Box 716, Norfolk 1, Virginia.

FOREIGN, Alaskan, USA, Job Opportunities!! To \$1500 Monthly! Million Americans, Employed Overseas. Copyrighted Reports. Who to contact for highest paying jobs. Laborers—Trades—Truck Drivers—Office—Engineers, Many Others. 52 Countries—St. Lawrence Project, Spain, Latin America, Northern Projects, Europe, Year Registration—Advisory Service. Application forms. Unconditional Money-back Guarantee! \$2.00 (Airmailed \$2.25) (COD's Accepted). International Reporter, St. Louis 1-SJ, Missouri.

FLORIDA jobs galore! Contacts, \$2.00. Hayward Parker, 1737 Cortez Rd., E., Jacksonville, Florida.

TULSA, Oklahoma, Oil and Aircraft. Complete classified section Sunday edition \$1.00. Harold's, 7147 E. Young St., Tulsa, Oklahoma.

AVIATION and Guided Missiles employment (U.S.A. and Canada). Companies, persons to contact and application blanks \$2.00. Pestech, Box 548PA, St. Louis 1, Missouri.

IF you have a product or service that can be operated on a mail order basis, write me today. I will send you a Free Kit on "How To Make Money Out Of Classified Advertising". Next issue will be October. Closing date August 23. Hurry—Do it Today! O. K. Kelly, Classified Adv., Mgr., Dept. A8, 353 Fourth Avenue, New York 10, N. Y.

## 43 AGENTS WANTED

EVERY man a prospect. Request free sales kit. Show line of belt buckles, individualized with prospect's personal name and emblems also transportation, police, fireman badges. Choice 3,000 emblems. Hook-Fast, Box 1425-PS, Providence, R. I.

YOUR own business—Suits \$1.50; Overcoats 65c; Mackinaws 35c; Shoes 12 1/2c; Ladies' Coats 30c; Dresses 15c. Enormous profits. Catalog Free. Nathan Portnoy Associates, 605-J West 12th Place, Chicago 7.

AGENTS—300% profit selling genuine gold window letters; stores and offices. Free samples. Metallic Sign Letter Co., 431-E North Clark, Chicago.

GOLD or Silver letters, numbers. Windows, Doors, Trucks 1" to 6". 500% Profits—Free Samples. Atlas-U, 544 West 79th, Chicago 20.

NEW Jobs open in selling! Send name, address for five free issues of Opportunity Magazine's money-making guide, listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity, 850 N. Dearborn, Dept. 18, Chicago, Illinois.

BUY Wholesale thousands nationally advertised products at big discounts. Free "Wholesale Plan." American Buyers', Hertel Station, Buffalo 16-L1, N. Y.

GOLDMINE Of 600 money-makers. Copy Free. Specialty Salesman Magazine, Desk 6-B, 307 N. Michigan, Chicago 1.

FREE! Beautiful Feather Pictures 200% Profit! Apartado 9036, Mexico 1, D.F.

MEN—Women Agents; Sensational new money-makers — Beautifully hand-painted, plastic personalized photo enlargements, compacts, rings, bracelets, lockets, etc. Simply take orders, pocket 40% commission—we deliver and collect. Sales outfit free. Novelco, 3343 North Avenue, Chicago 47.

MOORE Made \$9.00 In An Hour . . . selling farmers. Hundreds of salesmen making good money full time or spare time with 3 leading poultry magazines welcomed everywhere. No investment or experience needed. Powerful sales kit free. Poultry Tribune, Box 568, Mount Morris, Illinois.

\$1,000.00 A month for making dramatic 3-second demonstration of amazing lightweight Presto Fire Extinguisher. New chemical used by Airforce snuffs out fires instantly. Only \$4.95. Terrific commissions. Millions want it. Free Kit. Merlite, 114 E. 32nd, Dept. P-52K, New York 16.

BIGGEST Christmas Card Profits. Sensational "Super-36" Assortment pays \$1.25 profit on every box—\$50.00 on 40 boxes easy. 200 fast sellers double earnings! Tall cards, Novelties, Stationery, Bargain Specials. Assortments on approval. Color catalog. Personalized Album Free. Midwest, 1113 Washington, Dept. 495-R, St. Louis 1, Missouri.

SELL Newest Tall Christmas Cards—make 75c on sensational \$1.25 Assortment. 250 hottest Gifts, Cards, Stationery. 50 Exclusive Personalized designs, Super-Roll Gift Wraps, 30 for \$1 Box. Samples on approval, surprise offers, prompt action Gift. Cardinal, 1400 State, Dept. J-80, Cincinnati 14.

AT Last! Something New and Sensational in latest Tall Christmas Cards. Make Extra Money Fast! Show Satins, Velours, Metallics. Gets Easy Orders. Pays up to 100% Profit. 30 Free Samples. With Name 50 for \$1.50. Big Line. Amazing Convertible Pen-Pencil, Napkins, Gifts, Stationery. Several \$1.00 Boxes on Approval. Puro Greetings, 2801 Locust, Dept. 641-K, St. Louis 12, Missouri.



# POPULAR SCIENCE OPPORTUNITIES

**NEW Bathroom Deodorizer.** Hangs on wall. Banishes odors bathroom, kitchen. Lightning seller. Samples sent on trial. Kristee Co., Dept. 50, Akron 8, Ohio.

**AMAZING** new "Touch-Glow" Christmas Cards sell swiftly from Free Samples. \$62.50 profit on 50 boxes easy! Many Tall Cards, Stationery, Novelties, Album of Imprints. Profits to 100% plus Gift Bonuses. Samples on approval. Creative, 4401 Cermak, Dept. 510-D, Chicago 23.

**GOOD** Man Can make \$3,000.00 next 90 days. Every house in town wants amazing Nite "cats-eye" lawn sign. Automatic selling plan pays profits everyday. Write today for Free details. Nite, 173 W. Madison, Dept. 302, Chicago.

**RUN** Spare-Time Greeting Card and Gift Shop at home. Show friends samples of our new 1956 Christmas and All-Occasion Greeting Cards and Gifts. Take their orders and earn to 100% profit. No experience necessary. Costs nothing to try. Write today for samples on approval. Regal Greetings, Dept. 90, Ferndale, Michigan.

**CALIFORNIA** sweet smelling beads, sensational sellers. Particulars free. Mission, 2328-P West Pico, Los Angeles 6, Calif.

**IF** you want to earn money fast, I'll send you Free Sample Stocking Of newest Stretch DuPont Nylons to sell at only \$1 a pair. American Mills, Dept. 496, Indianapolis 7, Indiana.

**ADD \$20.00 to \$200.00 Per Week** To Your Income with Miracle Bowls! Sell door to door and store to store. "Just Add Water And Watch Them Grow." Write for free literature now. Miracle Bowls, Dept. 4, Littleton, Colorado.

**ANYONE** can sell famous Hoover Uniforms for beauty shops, waitresses, nurses, doctors, others. All popular miracle fabrics—nylon, dacron, orlon. Exclusive styles, top quality. Big cash income now, real future. Equipment free. Hoover, Dept. H-101, New York 11, N. Y.

**WILL** you wear new suits and topcoats without one penny cost and agree to show them to friends? You can make up to \$30.00 in a day even in spare time without canvassing. Stone-Field, 532 South Throop St., Dept. W-926, Chicago 7, Illinois.

**CALENDARS, Advertising Novelties, Matches.** All styles, including Religious. Varnished 12 sheet. Girls. Hundreds of Advertising Novelties, Book Matches, etc. Fleming Calendar Co., Promotional Division, 6539 Cottage Grove, Chicago 37, Ill.

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## 66 BUILD IT YOURSELF

**AIR Conditioners**—Home, Automobile. See Kool Engineering ad page 241.

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## 67 OLD GOLD, JEWELRY, WATCHES, ETC.

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## 54 POPULAR SCIENCE

## 69 FOR THE HOME

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**QUICKSILVER**, Sterling, Silver Solders, precious metals. Mercury Terminal, Norwood, Massachusetts.

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**TATTOOING Outfits**, licensed course. Brochures 25c. Zeis, 728 Leslie, Rockford, Illinois.

**TATTOOING supplies**. Free catalog. Spaulding & Rogers, Court St., Jacksonville, No. Carolina.

## 77 GEIGER COUNTERS & TREASURE FINDERS

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## 78 WATCH REPAIRING

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**WATCHMAKERS' Tools, Materials, Supplies, Watches**. Catalog. Gales, Box 1000, Chicago 90, Illinois.

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**WATCH** and clock repairing books. Free information. North American, Dept. 26H, 2320 N. Milwaukee, Chicago 47, Illinois.

## 79 MISCELLANEOUS

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ON A WARM August evening in 1870, a footsore stranger in naval officer's uniform walked into East Haddam, Connecticut.

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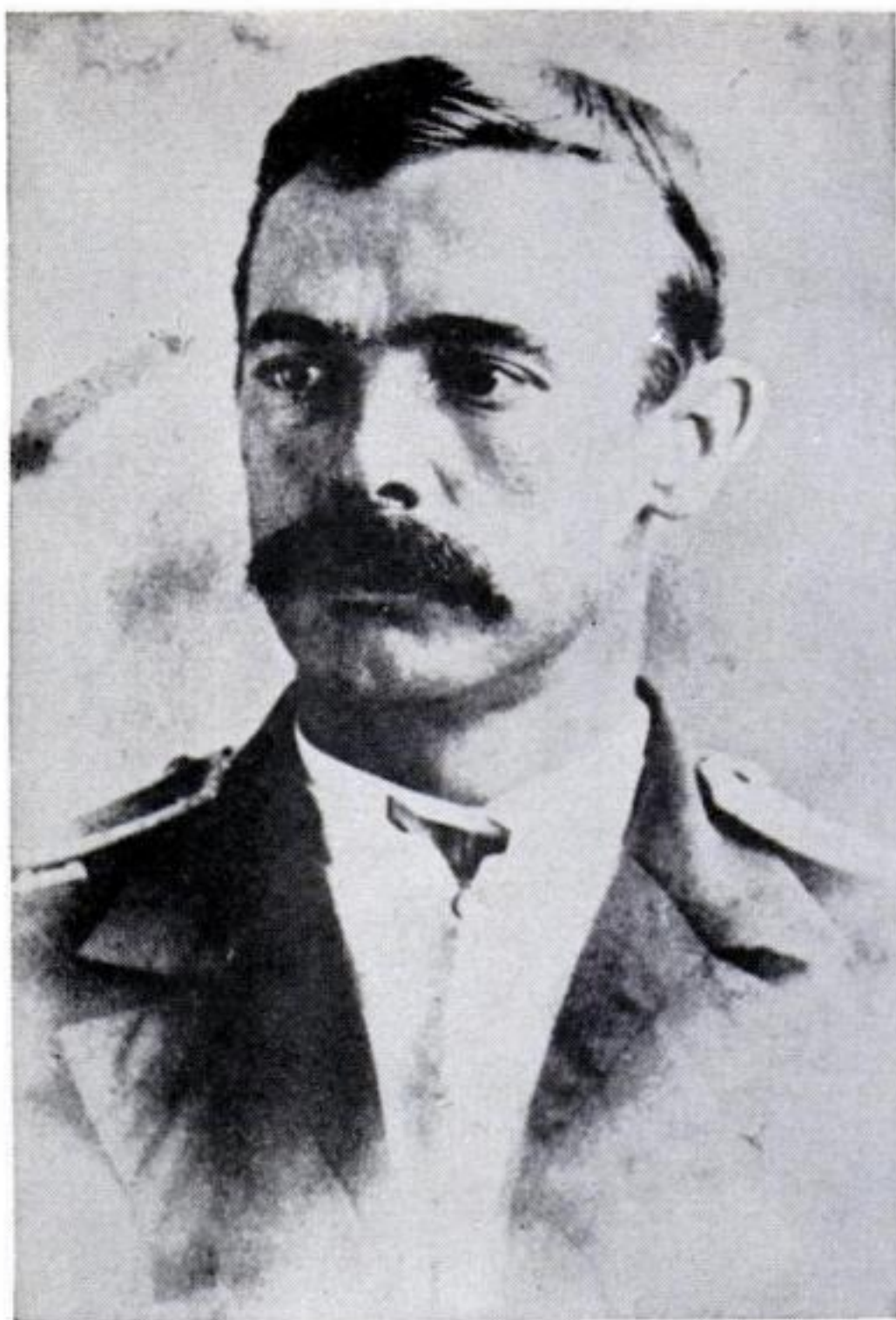
He was trudging cross-country *on foot*. And conscientiously wiring in daily progress reports well-calculated to give his superiors apoplexy. His sixth, from Albany, N.Y., read in part:

*"Entered Albany barefooted X Comfortable X Earning my keep as bartender X Local rum far superior that served in Navy X Am sending sample"*

At this, the Navy struck its colors, reversed its time-honored tradition, and began pre-paying travel allowances.

Strangely enough, Joe Fyffe actually wound up as a rear admiral. That, of course, was years later; and he has long since passed to his reward. But his vigorous and outspoken independence is still alive and kicking in today's Americans. That's why our country is a strong, vital nation and why our country's Savings Bonds are one of the finest investments in the world.

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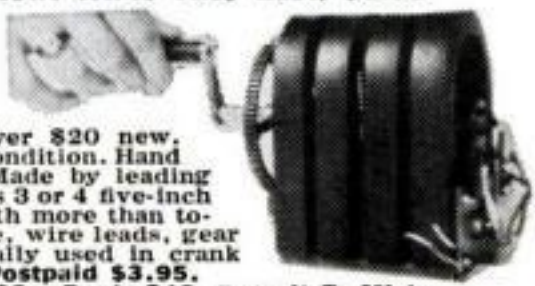
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# Craftsmen At Work...



Have you recently completed a project of which you are particularly proud? Send a good picture, with the negative and a brief description, to POPULAR SCIENCE MONTHLY's Mechanics and Handicraft Editor, 353 Fourth Ave., New York 10, N. Y. We will pay \$10 for each item accepted.



**Look-Alike Cars.** This little car started out to be a play auto that daughter Anita could pedal. But Papa Hausle, a master mechanic in Stuttgart, Germany, ended with a three-speed miniature that goes

30 m.p.h. Only drawback: It took four years to build, and Anita (above right), who is now 13, is too big to fit. But Hausle liked it so much he built one for himself, a full size job (top photo).



**Baby Tractor Does Big Job.** With a dozer blade on the front and a trailer hitched to the rear, this little tractor built by Loren M. Sundquist does much of the work on his farm at Wasta, S. D. It has a Kaiser rear axle shortened to a 40-inch track, a three-speed Chevy transmission and a five-hp. air-cooled engine that drives it at about five m.p.h. in high.



**Mower Is Run from Wheel Chair.** Push buttons on a panel that Ray Bucholz of St. Petersburg, Fla., installed on his wheel chair operate this electric power mower in any direction. Turns are controlled by solenoids which push out a plunger to press a shoe to the ground at the right or left wheel. Either solenoid will make the machine cut around in a circle.



# IDEAS FROM WELDWOOD

## THIS MONTH'S PROJECT—POWER SHOP WORKBENCH



### This Month's Hints

**Leaky cellar doors?** If your cellar is constantly wet because rain leaks through battered cellar doors, replace the doors with panels of  $\frac{3}{4}$ " Duraply®. A Duraply panel has no cracks or seams so water can't leak through . . . and Duraply is weather-proof, too. You'll find that Duraply's supersmooth surface makes painting easier. E. G., Lynn, Massachusetts.

Got a table, TV set or bench with a worn, scratched top? Here's how to fix it up like new. Get a  $\frac{1}{8}$ " thick piece of Weldwood Plywood (birch, oak, or any other wood); cut to proper size and glue on as a new top with Weldwood Contact Cement. Then you can paint, or finish natural. To conceal plywood edges, edge the furniture with new Weldwood Flexible Wood Trim. C. F., Van Dyke, Michigan.

**Traveling fun.** Take a square of Weldwood Plywood—about  $6\frac{1}{2}$ " x  $6\frac{1}{2}$ "—drill holes in it about  $\frac{3}{4}$ "

the work surface is Weldwood Duraply®—the plywood with the special tough overlay that's twice as wear-resistant as ordinary plywood. Duraply's supersmooth surface also assures you of no splinters, virtually no checking, and better painting qualities.

### THE WELDWOOD QUESTION BOX

**Q.** After installing Weldwood Paneling, I've got some odd-sized scrap pieces left over. What can I do with them?

**A.** If you have pieces of different species and of the same thickness, you can make interesting bread and cake boards.

Bond strips together with Weldwood Resorcinal Glue . . . let it set . . . when dry, finish with 2 coats of Satinlac®. These decorative, mosaic-like boards will last and last, and are definitely a conversation piece. Your own imagination is the only limit on how attractive you can make them.

**HAVE A QUESTION?** Send it to "The Weldwood Question Box," 55 West 44th St., New York 36, N. Y.

apart and you have the beginning of a nonslip checkerboard to use while traveling. Checkers can be made of dowels cut to about 1" length. T. P., Albany, New York.

#### \$10 FOR YOUR IDEAS

for "This Month's Hints," if accepted for publication. (Hints must apply to some Weldwood product.) Send them to "Weldwood Hint Editor," 55 West 44th St., New York 36, N. Y.



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PS 8-56

Please send me FREE plans, detailed drawing and material list for the DeWalt Power Shop Cabinet.

NAME.....

ADDRESS.....

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AUGUST 1956 59



Everyone has his own pet idea of a gadget that he would like to see in general use. These five ideas were suggested by POPULAR SCIENCE readers. What is *yours*? We will pay \$5 for each one published. Please use Government post-cards only. Write your name and address clearly. Contributions cannot be acknowledged or returned.

## I'd like to see them make...



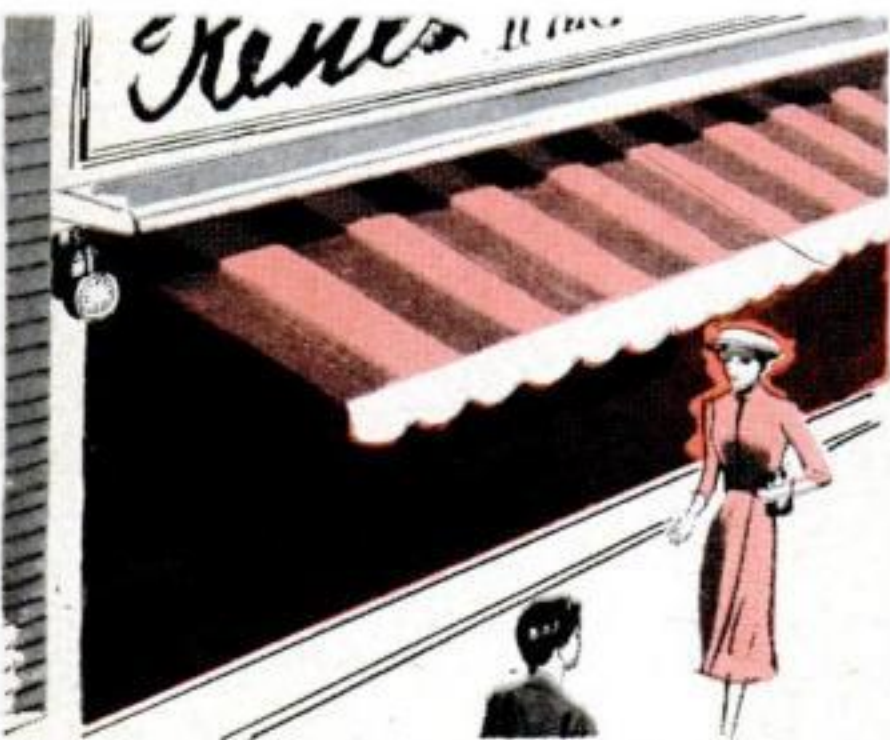
**AN ERASER KEY ON TYPEWRITERS.** A tiny clip-on pad soaked with special eradicator could be fixed over some present key that is rarely used.  
—Geo. Stevenson Jr., Greenwich, Conn.



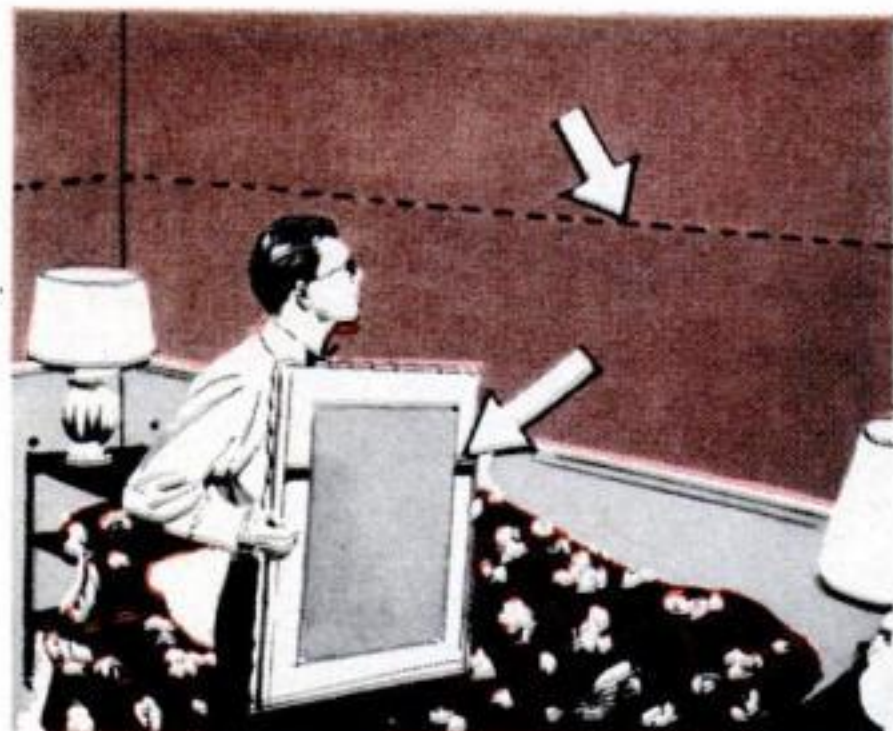
**GROCERY CARTS WITH ADDING MACHINES** built into them so that the customer could add up as she moved from shelf to shelf and not exceed her budget.—B. D. Phillips, Los Angeles.



**DIVIDED CAR TRUNKS** with an unobstructed upper compartment for luggage and a lower one with sliding floor or pull-out rack for tools and spare tire.—N. P. Adams, Bridgeton, N. J.



**TIME-CONTROLLED AWNINGS.** An electric motor actuated by a time clock would raise and lower a store awning daily, even when the shop was closed.—R. Birnbaum, New Britain, Conn.



**MAGNETIC PICTURE HANGERS.** A metal strip embedded in the wall plaster would attract magnets mounted on the backs of picture frames.—Wm. S. Ratchford, Staten Island, N. Y.



LOOKING FOR JOB SECURITY AND SUCCESS?

# LET MY STUDENTS AND GRADUATES TELL YOU

## ABOUT MY TRAINING—

### \$60 A WEEK IN SPARE TIME



I have the skill and know-how to do the work I love best and to enjoy better things in life, thanks to RTTA. I am working at TV servicing and making \$60 a week sparetime.

Harold Gimlen, Flint, Mich. 4/21/54

### HAS OWN BUSINESS



I have a shop at home and have been working on radio and TV after working hours of my regular job. I average \$50 a week for this part time work. RTTA training helped me in making extra money and giving me experience in the electronic field.

Richard Hennis, Little Rock, Ark. 4/20/54

### AIRCRAFT INSPECTOR



With RTTA training and through repairing radios and televisions for the right people at the right price, I was able to make the right contacts. I am now an Inspector for Douglas Aircraft at about \$125 a week.

Hugh Maddox, Los Angeles, Calif. 4/20/54

### ELECTRICAL TESTER



RTTA training has helped me understand TV and many variations of simple circuits. The course covers all subjects very clearly. I am now an Electrical Tester for Western Electric Co. at \$83.42 a week.

Raymond Lapan, Burlington, N. C. 1/24/54

### SERVICE MANAGER



I manage two radio and television shops, one here and one in Pompano Beach. RTTA training increased my knowledge of TV circuits and showed me new, quicker methods of repairing. Lessons as presented are very concise and clear.

William Phillips, Fort Lauderdale, Fla. 4/22/54

### REPAIRED EVERY SET



RTTA training helped me to understand TV more thoroughly. I have repaired every set that I was called on to repair.

Andrew Busi, Jr., Iselin, Pa. 4/21/54

L. C. Lane, B.S., M.A.  
President, Radio-Television Training Association.  
Executive Director, Pierce School of Radio & Television.



## —ABOUT MY EQUIPMENT

YOU GET ALL THIS EQUIPMENT



### "... a money making little gem."

I have completed kit #4 and was amazed at how it works. I showed it to a friend of mine and he asked me to set it up for one of the picnics his social club was having. That sure is a money making little gem.

John Fernandez, Fresno, Calif. 4/7/54

### "We get excellent pictures..."

I would like to compliment you on an excellent and complete course. We get excellent pictures on my TV set from WSYR (Syracuse, N.Y.), approximately 110 air miles away. The set is working good and I have had to replace only three tubes since I assembled it two years ago.

Larry H. Stafford, Kingston, Ont., Canada 7/1/54

### "... very good reception..."

I have really enjoyed the course and have come a long way in TV servicing. I am getting very good reception on my TV station considering that the nearest VHF station is 120 miles.

J. W. Hanlon, Jr., Henderson, Texas 7/12/54

## YOU, TOO, CAN GET A BETTER-PAYING JOB IN THE EVER-EXPANDING RADIO-TELEVISION-ELECTRONICS FIELD

Why limit yourself and your earnings because of your lack of training. Learn **AT HOME** in your **SPARE TIME** to be an electronic technician, television repairman, or studio technician. You don't need any experience whatsoever. Many students earn up to \$25 weekly in spare time while learning.

After you finish my Radio-FM Television Course or FM-Television Course you can have, if you want it, two weeks of laboratory training at my associate resident school in New York City—AT NO EXTRA COST.

If you have had previous radio and television experience you can take my practical TV Cameraman and Studio Technician Course to qualify for a good-paying job in a TV studio.

Write to me today and let me show you how you can begin now to put yourself on the road to a better future.

## VETERANS!

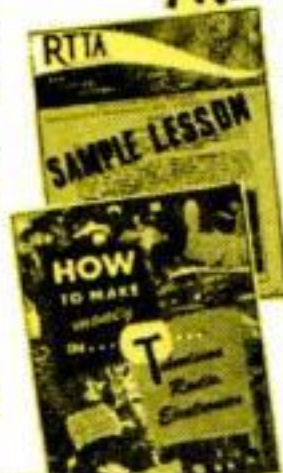
My school fully approved to train veterans under new Korean G.I. Bill. Don't lose your school benefits by waiting too long. Write discharge date on coupon.

## Radio-Television Training Association

52 EAST 19th STREET • NEW YORK 3, N. Y.

Licensed by the State of New York • Approved for Veteran Training

YOU GET THESE FREE



### MAIL THIS COUPON TODAY!

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RADIO-TELEVISION TRAINING ASSOCIATION  
Dept. P-8C, 52 East 19th Street, New York 3, N. Y.

Dear Mr. Lane: Send me your NEW FREE BOOK, FREE SAMPLE LESSON, and FREE aids that will show me how I can make TOP MONEY IN TELEVISION. I understand I am under no obligation.

(PLEASE PRINT PLAINLY)

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Address \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

I AM INTERESTED IN:

- ☐ Radio-FM-TV Technician Course
- ☐ FM-TV Technician Course
- ☐ TV Cameraman & Studio Technician Course

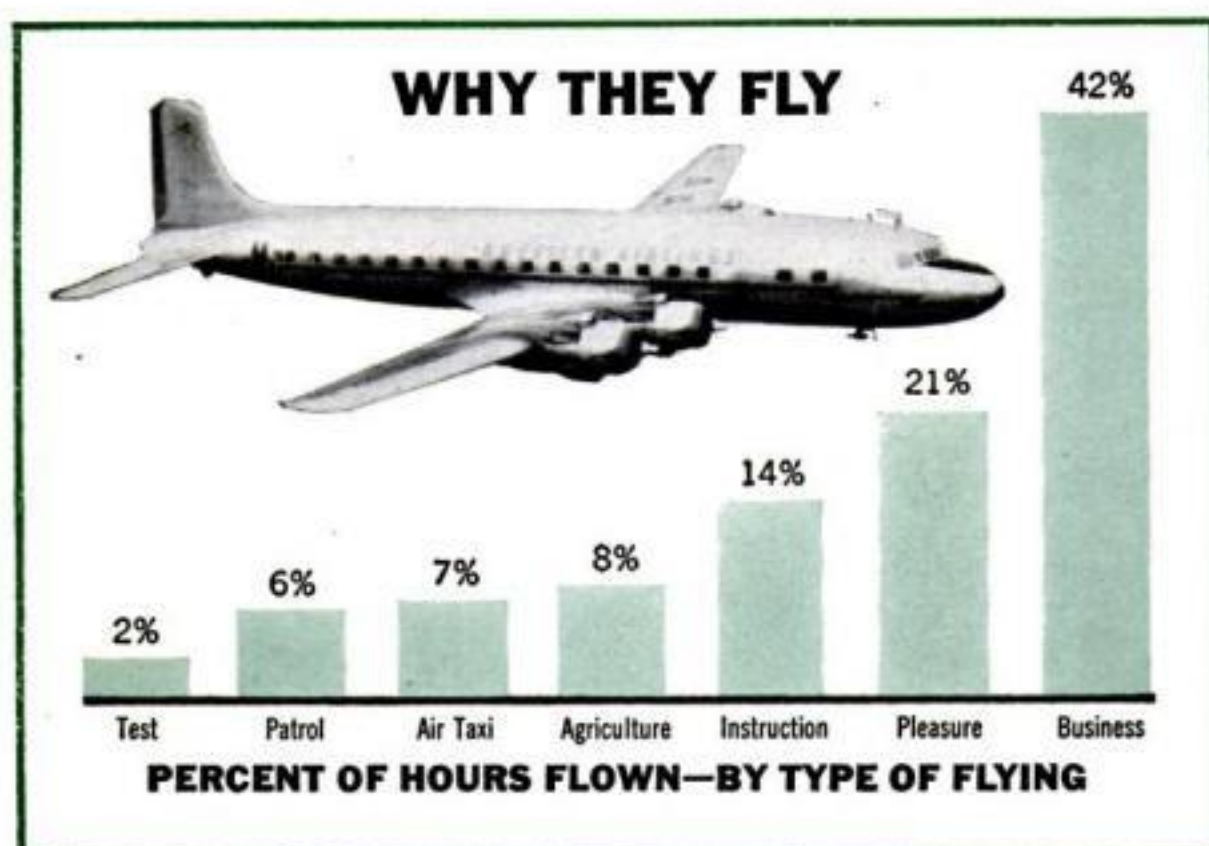
### VETERANS!

Write discharge date



**The point of no return** for machine civilization is close at hand, according to a forecast of the next century prepared by the faculty of California Institute of Technology. The Caltech professors envision a rosy future: a world two to 15 times as populous as it is now but supported entirely on low-grade raw materials such as air, sunlight, sea water and ordinary rock. Complex machines would concentrate these into useful things. But if a global catastrophe—all-out atomic war—destroyed the machines, all civilization would collapse, permanently. For the machines could not be rebuilt without high-grade materials, which by then would have been used up.

**People fly twice as much** for business reasons as they do for pleasure (see chart below). More surprising is the fact that scheduled airlines account for only one third of the total flying time, operate only one plane in 44.



**Buried treasure**, possibly worth \$200,000,000, is described in two of the famous Dead Sea scrolls. The 2,000-year-old embossed copper sheets were discovered four years ago in a Palestinian cave, but have just been deciphered. They tell of several separate hoards, including 200 tons of gold and silver, buried in the region between Hebron and Nablus in Jordan. The experts doubt that the treasure ever actually existed. Even if it did, it is unlikely to be located, since the directions in the scrolls are vague and the geography of the area has changed.

**Live cancer injections** will be given to 96 convict volunteers in the Ohio State Penitentiary. None of the volunteers is likely to contract cancer, since the human body normally kills such injected material. The doctors want to learn more about the way the body accomplishes this. Any cancers that do develop can readily be treated.

**A hot train**—railroad flat cars carrying intensely radioactive materials—to travel around the country and irradiate foods has been designed at the University of Michigan. It could treat potatoes in Long Island, citrus fruit in the Southwest, grain in the Midwest, seafoods at ocean ports. Purpose: to inhibit sprouting, sterilize insects, and kill spoilage-causing bacteria.

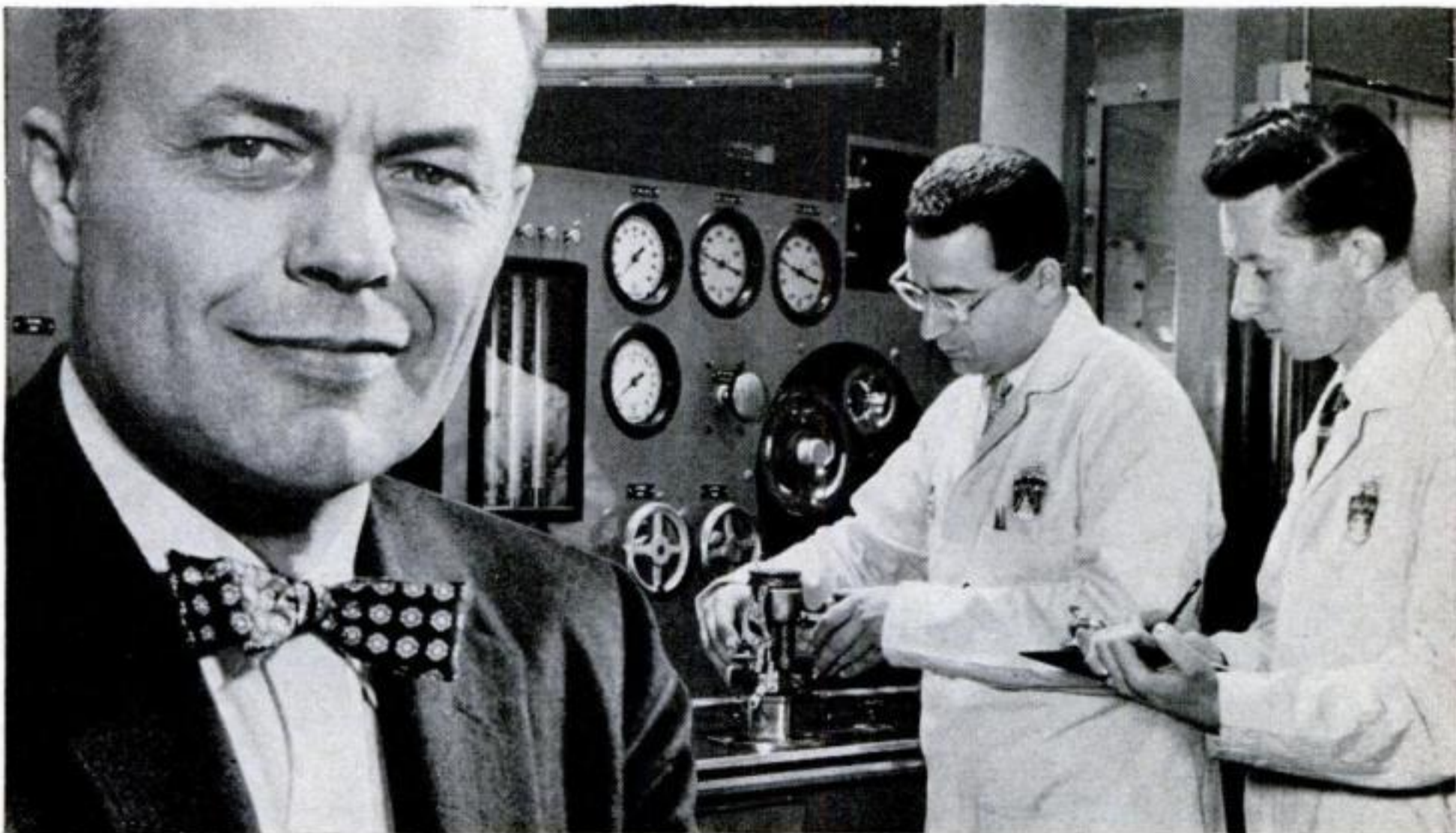
**Mars will be closer** to the earth next month than at any time since 1924. It will then be about 35,120,000 miles off. People in the New York area should get a clear look at the red planet in the southern sky from evening until sunrise.

**Good book.** The exploits of the Lifeguard League—the daring submarine crews who rescued downed Allied airmen within sight of the enemy in World War II—are excitingly told in *Zoomies, Subs and Zeros* (Greenberg, New York, \$3.95). The authors are experts on the subject: Vice-Adm. Charles A. Lockwood, who directed the League, and Air Force Col. Hans Christian Adamson, himself a “zoomie,” or combat flyer.



*For your Ford—always specify the carburetor with the*

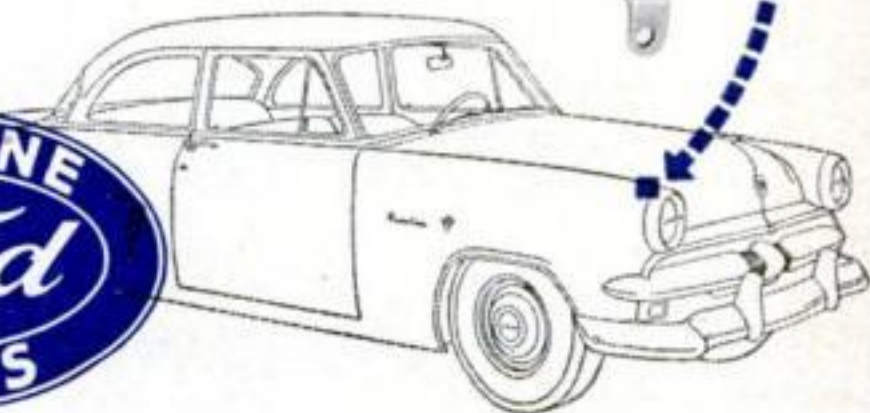
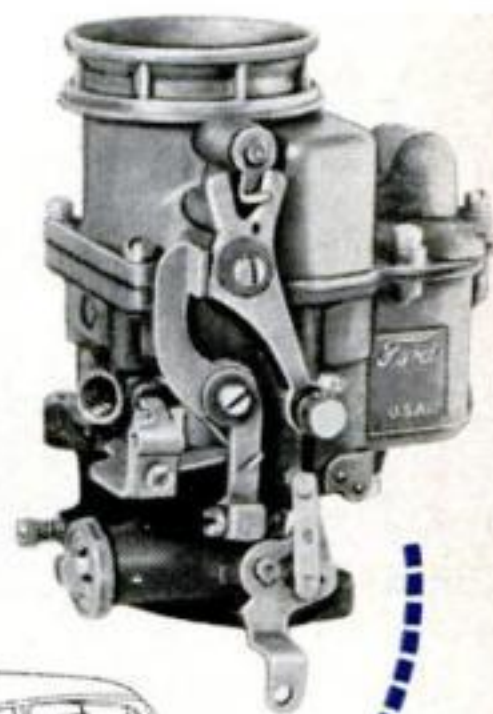
# THRIFTY FLOW



**"Genuine Ford Carburetors** are inspected before assembly and 100% flow-checked (above) after assembly," says Paul Clayton, Ford's Executive Engine Engineer. "Duplicating the flow of fuel and air to your engine from idle to high, this check makes sure the carburetor delivers to your engine *no more gas than necessary* for top performance. You can be sure of a thrifty flow when you specify a *Genuine Ford* carburetor."

***All Genuine Ford Parts are made right to save you money and trouble!***

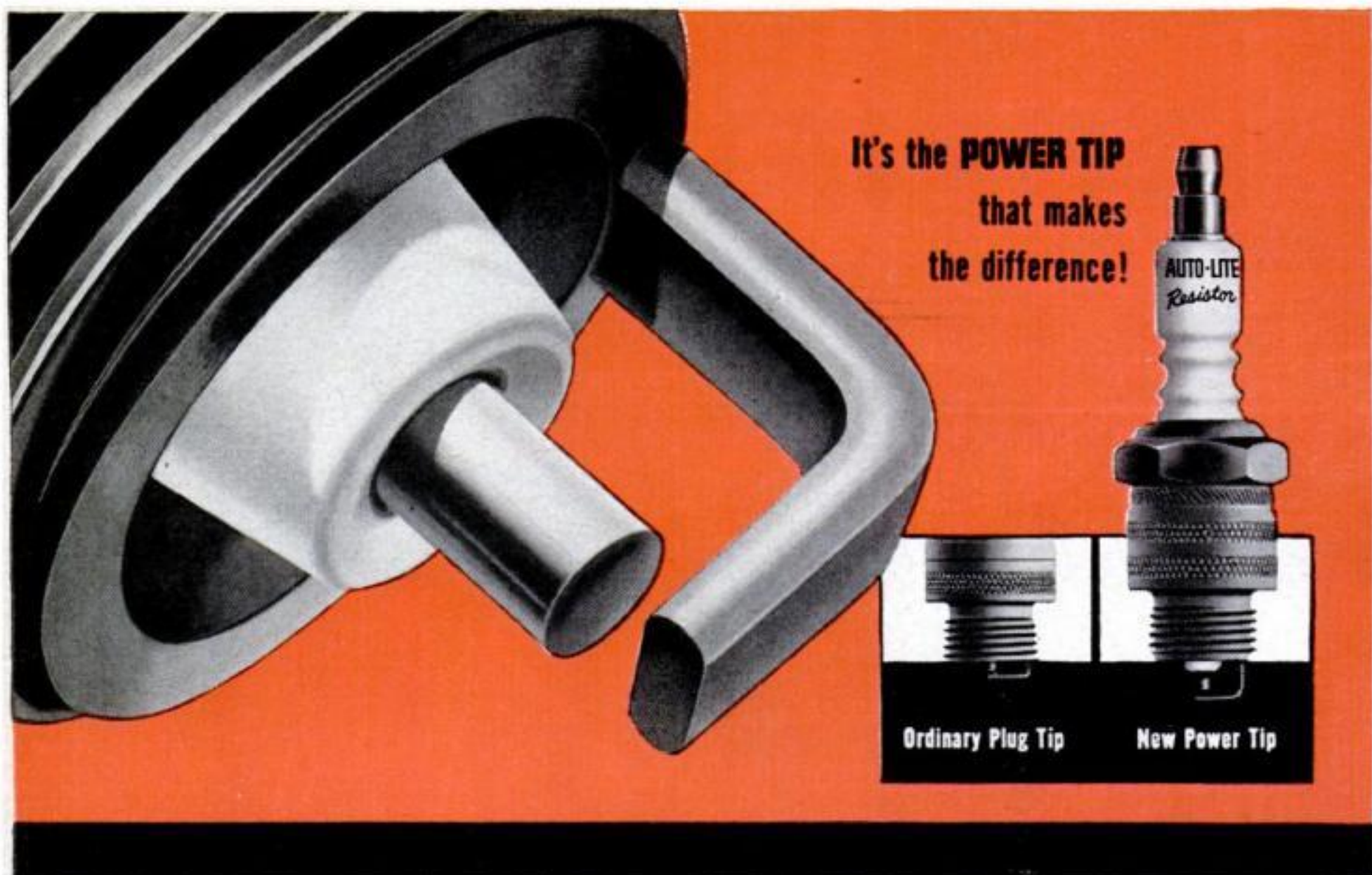
Every Genuine Ford Part—be it a carburetor, oil filter, battery or spark plug—is made to the same rigid specifications as the original part that it's replacing. Specifications set by the *same* men who originally built your car. That's why, when *any* replacement will add to your Ford's performance, it pays to specify "Genuine Ford Parts."



**Keep your Ford all Ford**

AUGUST 1956 63





It's the **POWER TIP**  
that makes  
the difference!



Ordinary Plug Tip

New Power Tip

Some spark plugs are designed for low speeds . . . some spark plugs are designed for high speeds . . .

# Only new **POWER TIP** "fires up" your engine at all speeds!

**No more need for old-type plugs in modern engines.** In the past, you had no choice but to use conventional type spark plugs in your modern overhead-valve engine. You had to choose between "hot" or "cold" plugs depending on whether your driving was mostly at *low* speeds or *high* speeds.

**Now new POWER TIP—one plug for ALL speeds!** Here's the difference. Projecting center electrode and ceramic tip—the **POWER TIP**—extends the spark gap in toward the center of the combustion cham-

ber. It operates *hotter* at low speed—resists fouling because deposits burn away clean. Yet the Power Tip takes advantage of richer intake gases in high-speed, wide-throttle driving—runs *cooler* and checks pre-ignition!

Available now for all these cars with overhead-valve V-8 engines using 14 mm plugs: Buick, Cadillac, Chevrolet, Chrysler, De Soto, Dodge, Plymouth, Ford, Hudson, Imperial, Lincoln, Mercury, Nash, Oldsmobile, Packard, Pontiac, Studebaker.

## AUTO-LITE **POWER TIP**

RESISTOR SPARK PLUG WITH

Auto-Lite manufactures over 400 products, including Spark Plugs, Batteries, Wire and Cable, and Automotive Electrical Systems . . . sold throughout the United States and Canada.





# Why Cars Are Going to Four Headlights

***Cadillac's flossy Eldorado Brougham, first of the '57 models, shows an exciting lighting system that's coming for all U.S. cars.***

**By Frank Rowsome Jr.**

**I**N A FEW weeks, persons whose pockets are disfigured by the unsightly bulge of a spare \$9,000—give or take a grand—can queue up to buy an Eldorado Brougham. This is a horseless carriage of quality, liberally fitted with such aids to gracious motoring as mouton carpets, electrically released doors and a manually operated Kleenex dispenser. Surveying the delights to which he has just taken title, a Brougham buyer may well overlook the fact that his new dreamboat has four headlights.

That would be a pity. The four-eyed feature is something that should not be

mislaid in a cloud of hydraulically operated perfume sprayers and custom-tailored armrests. It is instead a solidly engineered development that promises:

- To appear on several competitive luxury cars in coming months;
- To come out on most (perhaps even all) American cars a year from this fall, including those sold in large volume to Hoi and his pal Polloi; and
- To deliver low-beam illumination of such conspicuous excellence as to discontent the owners of cars having only a measly two headlights.

**Night and day.** Driving behind the new headlamps is a pleasure, even if you are accustomed to the improved sealed-



## Low beam with today's lights



Even when the oncoming lights aren't glaring, down-the-road illumination is often marginal.

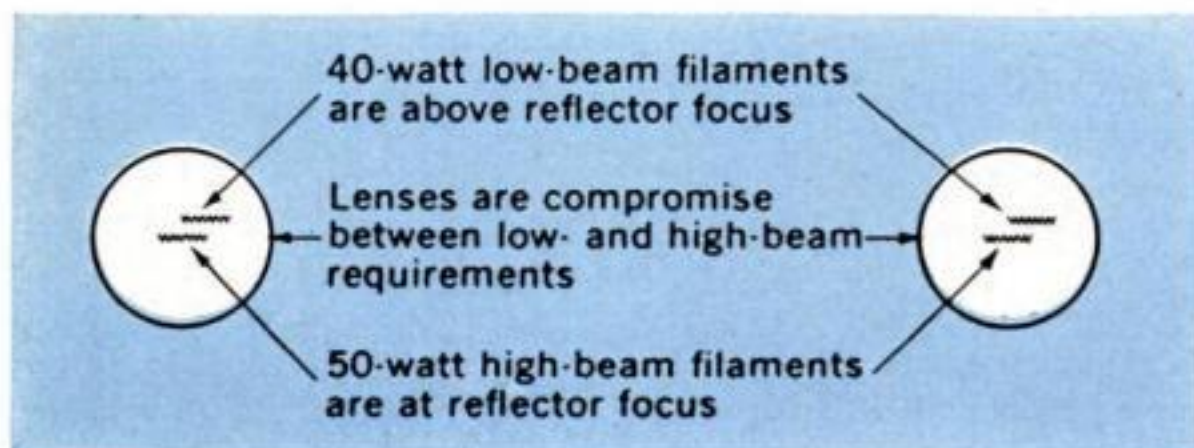
beam units brought out a little more than a year ago. (If the older sealed-beams are your standard, the new rig supplies the same sense of wondrous revelation that a first pair of eyeglasses brings to a nearsighted person.)

This writer tried out an engineering car, cobbled up by GM's Guide Lamp Division, on which it was possible to change at the flick of a switch from two units to the four-lamp system. On narrow Indiana and Michigan roads, the differences on high beam between the present and the new lighting were subtle but in favor of the new. The four-lamp high beams reach down the road toward the next county. On a clear night, you would need a fast car and a well-developed psychosis to "outdrive" the headlights. Two-lamp high beams, in comparison, do a similar job just a little less well.

On low beam the difference is spec-

tacular. Light is poured precisely where you need it, down the danger area along the right-hand margin of the road. At the times when low-beam lighting is most critical—meeting a glarey car on a narrow blacktop road—the new lights show off best, sneaking out about 275 feet, a gain of perhaps 100 feet of illumination alongside of and beyond an oncoming car. The new low beams give you adequate seeing for speeds up to 45 or 50 m.p.h. on an unlighted road. In contrast, many a present autoist going 30 m.p.h. on low beam is "outdriving" his headlights.

**They're civil, too.** The new system makes you feel inconsiderate at first; such juicy low-beam lighting, you feel, must annoy drivers of approaching vehicles. To your surprise, they go rolling past with neither irritable beam-flicking nor recourse to punitive high beams. The explanation, as you can see on care-



### TWO-LAMP HEADLIGHT SYSTEM

Today's headlights are shown in the diagram at left. Wattages specified are for the improved sealed-beam units introduced in mid-1955; earlier units were different. Compromises between ideal low- and high-beam characteristics have to be made.





Without blinding approaching driver, new lights reach out along the right-hand danger area.

ful study of the light pattern, lies in precise asymmetric aiming. In nontechnical terms, the lights spare the other guy by providing a notch of relative darkness in which he can slip past.

**Other side of the coin.** Engineers who have developed the new system concede that these improvements exact their price. If you press them, the engineers will tick off these drawbacks:

- The cost is a bit higher. Two extra units, with mounts, hardware and wire are needed. Balancing the frown that this brings to Detroit's cost accountants is the contented smile that it brings to stylists, now given a new "appearance area" to toy with.

- More juice is drawn. A car with two sealed-beam units expends 80 watts on low beam and 100 on high; with the four-lamp installation the wattage goes to 100 and 150 respectively. These

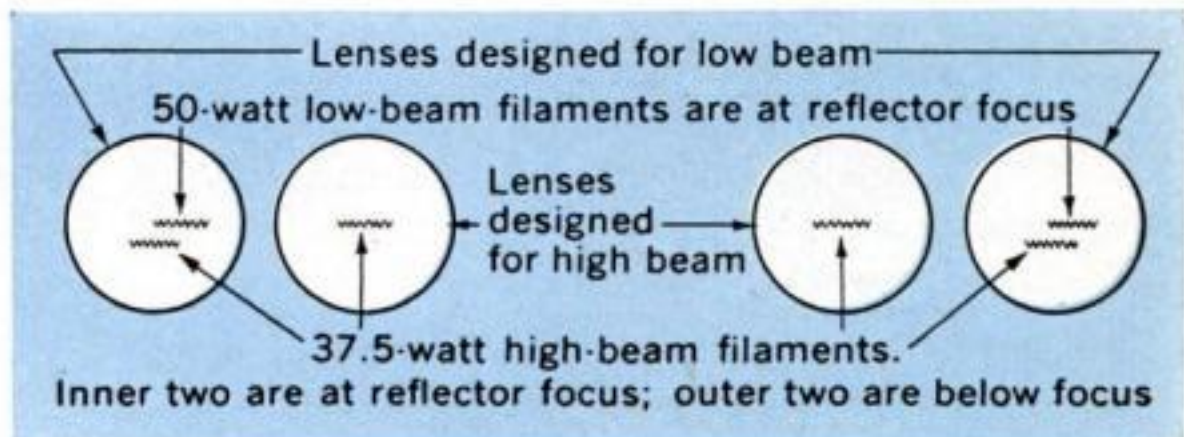
increases of 25 and 50 percent can be absorbed by most 12-volt electrical systems—providing they aren't already staggering under a load of miscellaneous electrical gadgetry. Though the new lamps won't strictly demand it, generator capacity may be raised a bit on four-lamp cars.

- Precise aiming is vital. Badly aimed, the new headlights could be vicious glarers. Headlight engineers refuse to concede that this is a real drawback: Present sealed-beam units can also be brutal if not set right.

**Mechanical aimers.** The engineers argue further that the general accuracy of aim on newer cars is increasing with the widespread garage use of mechanical aimers. These are ingenious gadgets; without them, four-lamp systems would almost certainly not be practical. Using three reference points on the face of each

## FOUR-LAMP HEADLIGHT SYSTEM

In the new setup, all four lamps are used on high beam, and outer pair only are used on low. But compromises of the present system are avoided; off-focus filaments of the outer lamps are employed only for "body light" on the high beam.







**SIX-EYED MONSTERS** were used by engineers in demonstrating the new system to state motor-vehicle officials. A flick of a switch changes lights from the present to the new system.

lamp unit, aimers work by measuring the relationship of the points to each other and to the horizontal. (The reference points, when the lamps are manufactured, are held within a few thousandths of an inch of established relationships to the filaments and reflector.)

This means that the lamps can be precisely aimed just by setting them to suit the aimer jig; they don't even have to be turned on. In most garages such an aimer gives better results than the classic method of reading hot spots on a measured wall. Lighting engineers suspect that, under the older method, hurried or careless mechanics often confused hot-spot reading with tea-leaf reading.

**Why make the change?** The four-headlight idea is not new. Discussed by automobile lighting experts since the late Thirties, it came strongly alive in the engineering back rooms about three years ago. The pressure came in part from three basic weaknesses of two-lamp sealed-beam lighting:

1. In the present sealed-beam lamp, both filaments can't be ideally located. If one filament is placed at the focus of the reflector, the other one can't be.

2. One lens can't be designed that meets the ideal requirements for both upper- and lower-beam duty.

3. The design compromises forced by these two problems have mainly favored the upper beam, in order to provide a well-defined hot spot needed for conventional aiming techniques. But that led to a third difficulty: It is the lower beam

that is the more critical one, and that is normally used more.

Four lamps were clearly a way around these difficulties. But not just four identical sealed-beam units, because they'd still be compromises. One attractive possibility discussed by a number of the engineering committees was two separate pairs of single-filament lamps, designed individually for high- and low-beam service. But so many other permutations were possible, too—reflectors of 5½ or seven inches in diameter, combinations of one- and two-filament units, and various changes in filament wattages—that the technical men debated and experimented for months before the new system was agreed upon.

**Not two and two.** Although tempting, the notion of two entirely separate pairs of lamps was finally discarded. It was felt to be inferior to the system finally chosen (two double-filament lamps on the outside, two single-filament ones inside) on two counts. One was that single filaments of the wattages desired for high-beam duty got to be a trifle bulky, in respect to the reflector focus point. The other was a safety point: In icing weather, a lit headlight usually generates enough heat to keep its lens clear. On a two-and-two system, a driver switching beams in a freezing rain might find himself with nothing but Braille to guide him.

**How it's done.** In the four-lamp system that has ultimately been adopted, only the outer two lamps are used for low beam. The filaments used then are at focus and the lenses are designed specifically for low-beam service. The result is much better lighting, especially in a higher-intensity hot spot that reaches down the road on the right side.

On high beam, all four lamps are lit. In the outer pair, the not-at-focus filaments are used to give general "body" to the upper beam. The inner lamps, with filaments at focus and lenses designed for the job, do the down-the-highway work. This arrangement avoids excessive foreground lighting.

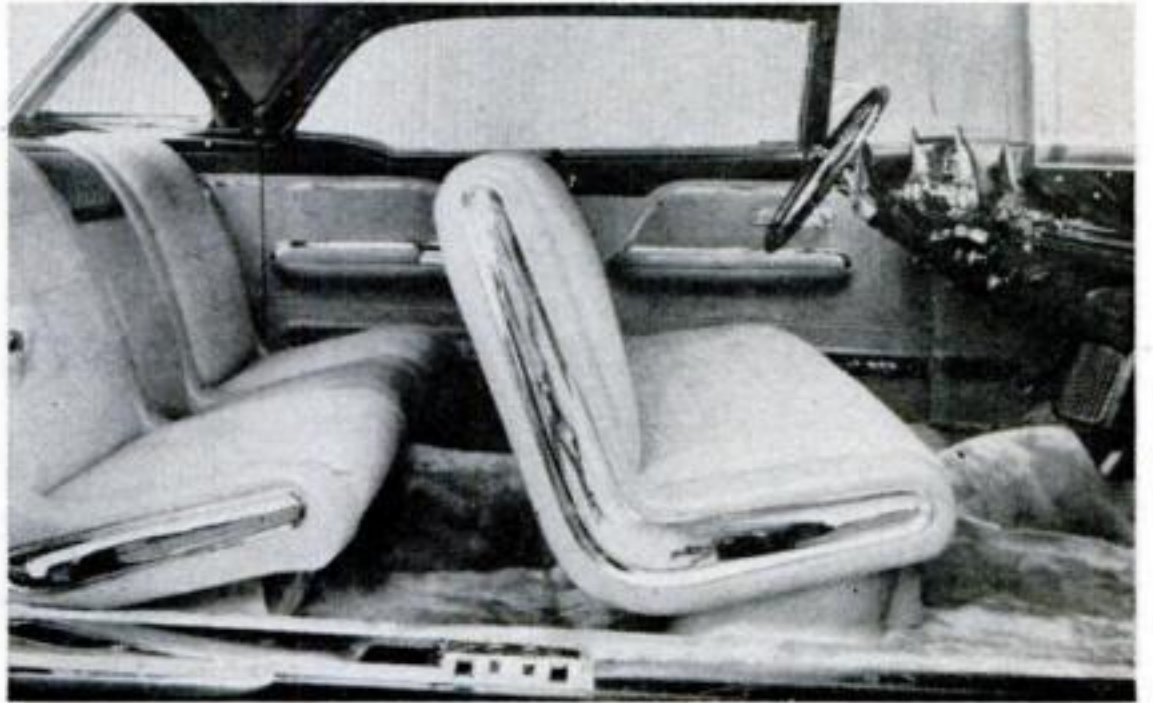
**Amateur experts.** Contrary to com-





**Next month you, too, can buy a dream car, the Eldorado Brougham, for about \$8,500 list**

**BESIDES HEADLIGHTS TO BURN**, the new luxury car has other unusual features. A four-door hardtop, its rear doors are hinged at the back. But possible safety hazards of this are countered by an elaborate electrical door-latch system, which is interlocked with the car's transmission and with a button under the driver's seat. Doors are electrically locked when selector is in Drive. At his destination a driver can raise all windows and lock all doors by a key turn in either rear door. At right, one of many interior upholstery combinations. Note mouton carpeting and door-latch recesses that are set into the pillarless sill.



mon opinion, the bright splash of light on the road ahead of the car isn't technically desirable. What you really need is illumination of anything *on* the road, plus lighting of the shoulders and some allowance for the effects of rises and dips in the road. "One problem of headlight designers," Bob Falge, Guide Lamp's chief engineer told me, "is whether to give drivers the kind of lighting they want, or the kind they can see best by. I don't suppose there's a driver alive who hasn't decided that he could improve on headlight design."

Aside from providing excellent illumination, the new four-lamp system gives a measure of protection against icing. It is conceivable that the high-beam lenses could ice up during a period of low-beam driving; but a driver suddenly switching to high-beam won't be in a jam—the outer lamps, which have been on all the time, will still give him fair lighting from the off-focus filaments, behind their already-warmed lenses.

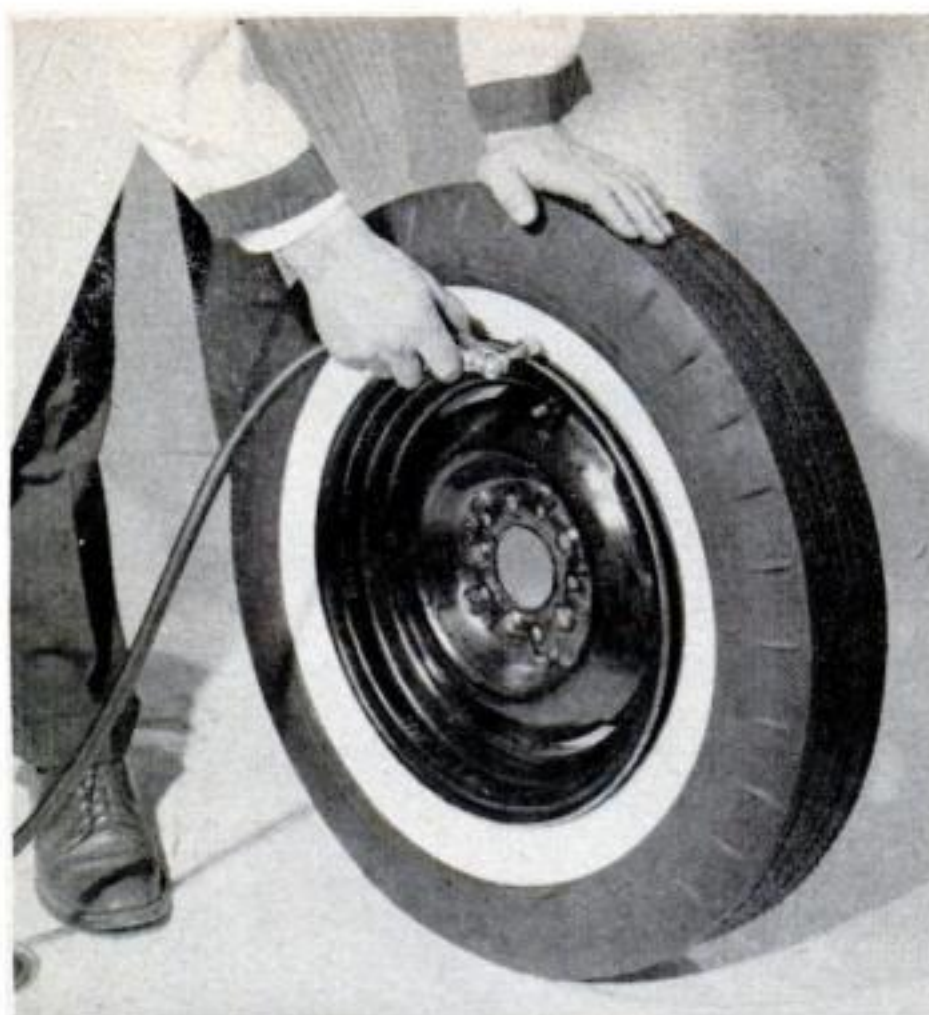
There's another quirk to the system, soon to be noted by cops everywhere. This is the fact that any car that goes by with four headlights lit is on high beam, and any with just the outer two lit is on low. This should simplify the problem of policing the slant-brow who keeps high beam on all the time.

**The legal side.** Pure chaos could develop from the combination of competitive auto makers building cars to be driven in 48 states having conflicting laws. It could, that is, but it doesn't. One reason is that in lighting, auto and lamp makers agree on technical standards; and many state legislatures are moving toward the goal of a reasonably uniform motor-vehicle code. Endless committee-work goes to the dovetailing of legal, technical and manufacturing problems.

At this writing, it seems highly probable that a four-lamp system will be legal everywhere by the time it's available. It also seems highly probable that you'll like it fine.

END

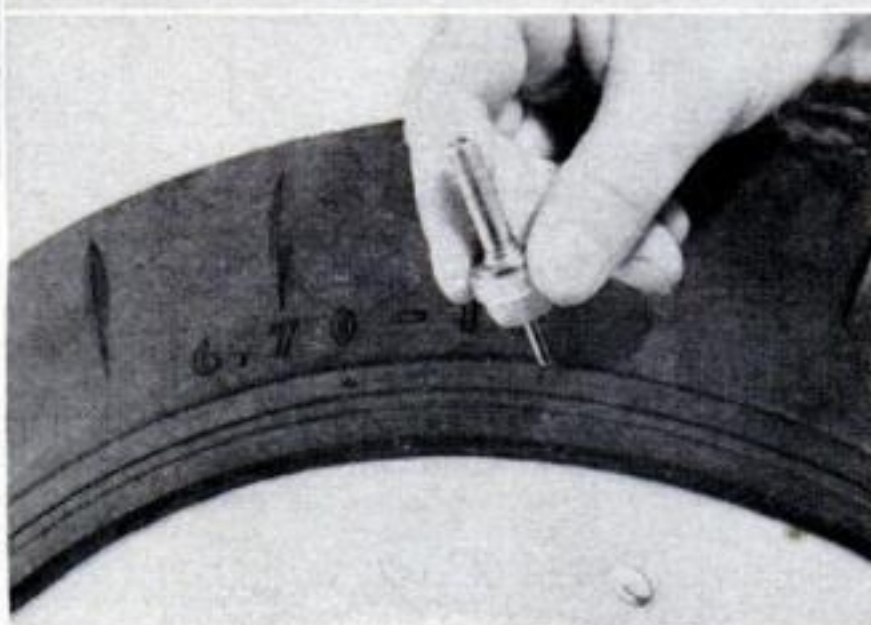
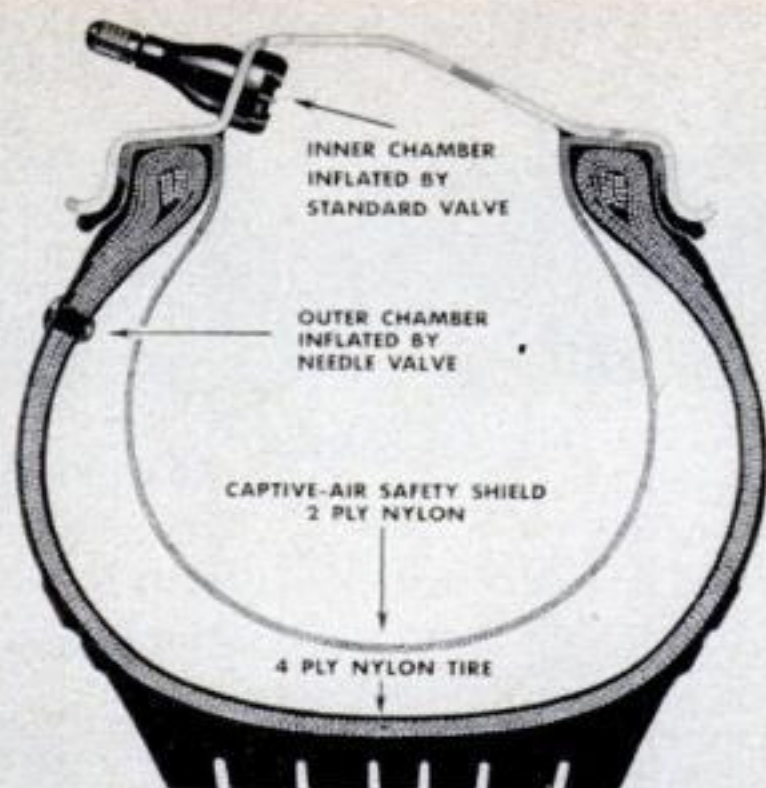




## New Two-Chamber Tire Will Roll 100 Miles After Blowout

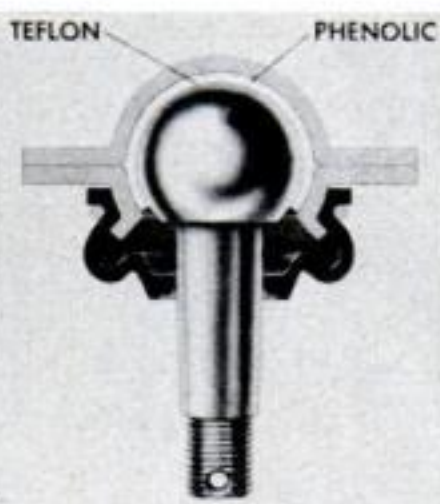
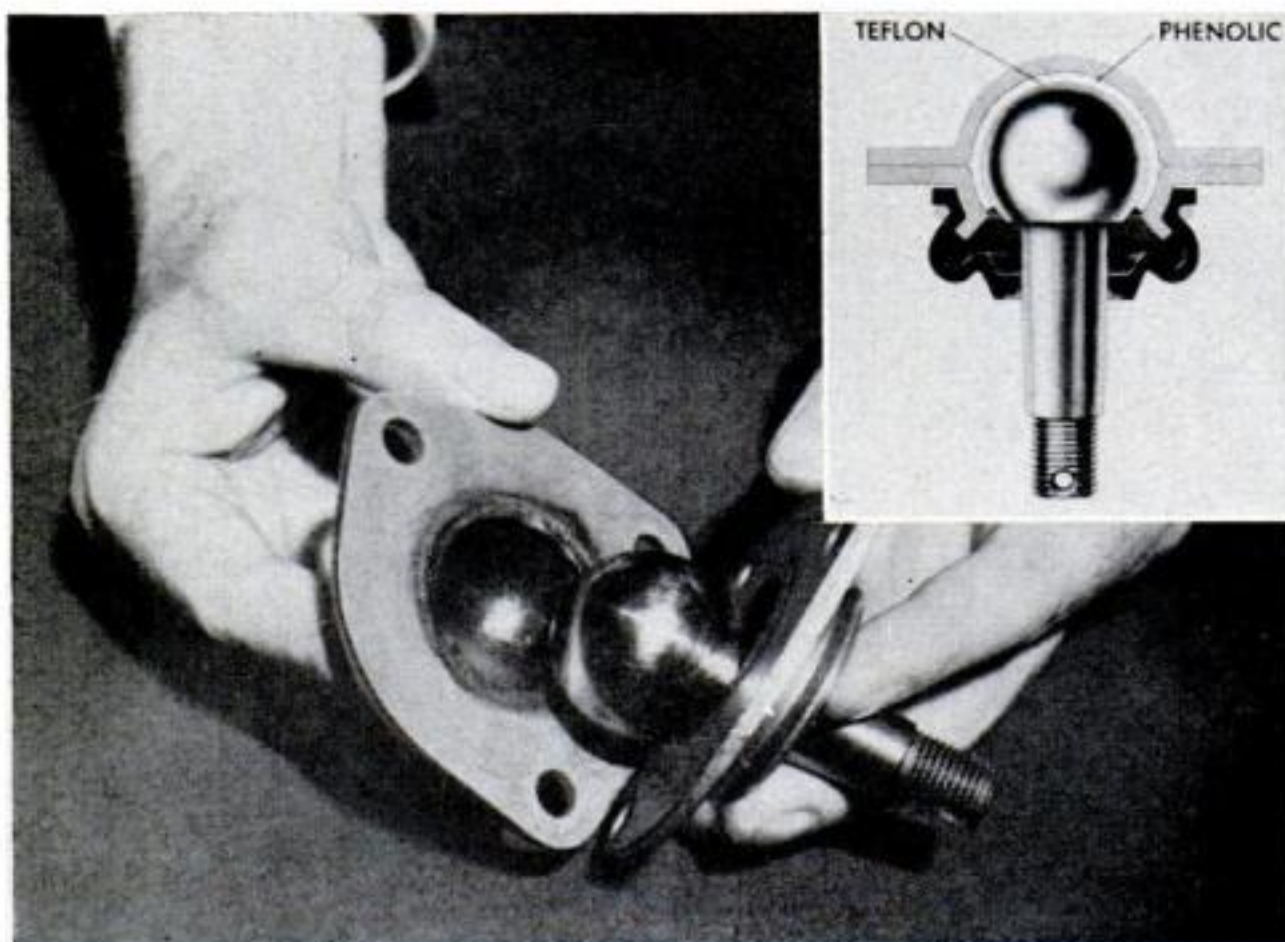
A BLOWOUT is no more than a minor annoyance with this new tire that carries its own built-in spare. You can travel on it for 100 miles or more at legal speeds after a wide-open blowout, says the manufacturer; in a test one went 261 miles.

Called the "Captive-Air" by Goodyear Tire & Rubber Co., this dual-compartment tire differs basically from other types by having no connection to leak air from inner to outer shell. The chambers are inflated independently: the inner



through a regulation valve; the outer through a hollow needle that you stick into a pip as you would in a basketball.

Because of it, the Goodyear people say, you may find the trunk smaller in future cars. You won't have to carry a spare.



## Fabric-Lined Cup In Auto Bearing Needs No Grease

TEFLON (technically tetrafluoroethylene), one of the world's slipperiest materials, is woven into fabric and used as a facing in auto suspension joints.

This new Du Pont fiber is backed by another synthetic for bearings made by American Metal Products Co., Detroit.





**Fast Pickup from River**

## Conveyor Belt Speeds Log Sorting in Maine's North Woods

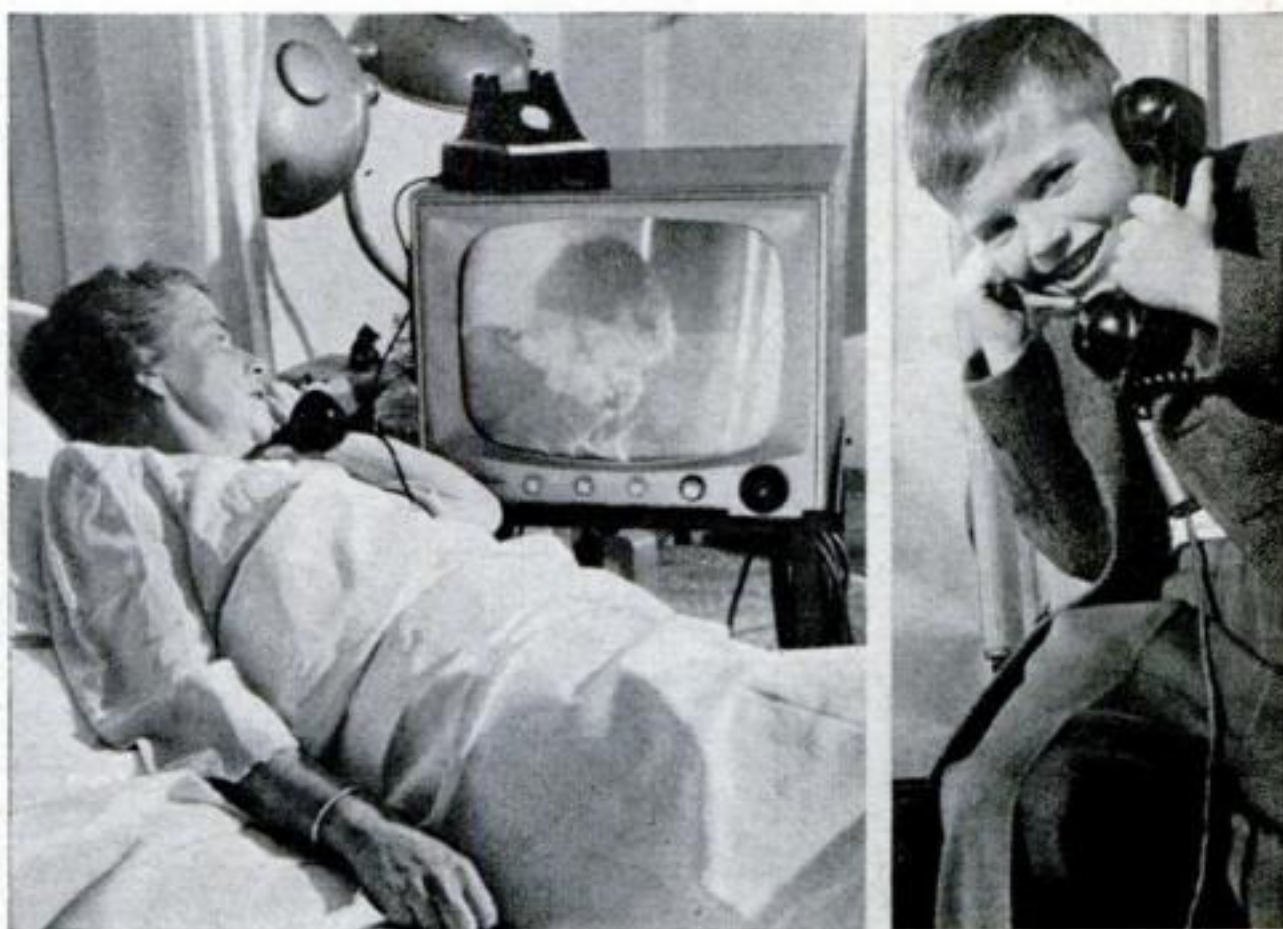
IT USED to take 90 men working three shifts to sort 2,000 cords of pulpwood a day at Winslow, Me., on the Kennebec River. Now three men handle the same

load in one shift, thanks to this first-of-its-kind conveyor belt developed by the Link-Belt Co. The device facilitates the sorting of logs for two different mills.

## Closed-Circuit TV Lets Patients See Visitors

RELATIVES barred from a patient's room can now do their visiting over television at Morristown (N.J.) Memorial Hospital, like the boy at right talking to his mom.

It's a new use of closed-circuit TV, by Dage Television, Michigan City, Ind., with camera and monitor built into booth.







*Open the apron*



*Close the apron*



*Come this way*

# 'Bulldozer U' Students Push Campus Around

**Ever wanted to run an earth mover? This unique school teaches how, in a month packed with hard work. Tuition: \$300; job prospects: excellent.**

**S**EVENTY-ONE hilly acres of North Carolina, after millennia of slow geologic change, have suddenly become some of the most agitated acres on earth.

About the first of each month, an array of awkwardly lumbering earth movers clips off hilltops, fills in valleys, and heaves up dams. In several weeks the massive machines are rolling more smoothly and the landscape is neatened up. Ponds begin to appear behind the dams; the slopes and banks assume graceful planes; and greenery sprouts once again on the torn terrain.

Then, the following month, the hilly acres undergo another convulsion. Down go the dams, off go more hilltops, and new fills and cuts slice across the landscape until every-



*Walk the crane*



*Lower the blade*



*Raise the blade*



*Dump your load*

**Exhaust racket requires signs**

**YOU GOTTA COMMUNICATE** to teach, and roaring exhausts get in the way. These gestures, used mainly in a student's first few solo hours on a machine, let the instructor on the ground signal his commands. A learner





Pushing over trees is more than just fun: Students learn the tricks to do it easily and safely.

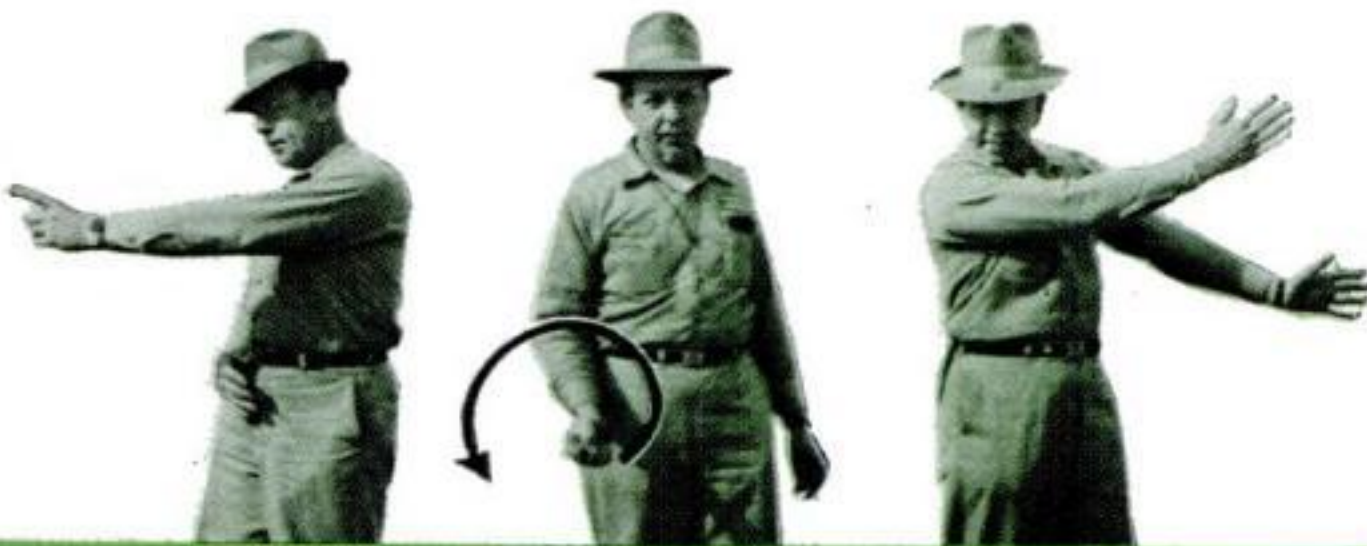
thing is changed as inexorably as the furniture in a restless woman's home.

What the agitated acres provide, in their monthly rearrangement, is a combined classroom and practice ground for some 30 students who are earnestly engaged in learning the art of earth moving.

These scholars are taking one of the three concentrated courses at the National School of Heavy Equipment Operation, a strange but highly successful institution about 10 miles from Charlotte, N. C. After being graduated, NSHEO students depart happily confident that contractors will pay



**SCHOOL'S FOUNDER** and director is Gilbert S. Shaw, who's made a career of teaching people how to handle machinery. He is planning to start a similar school somewhere in the west.



*Turn that way*

*Rev up your engine*

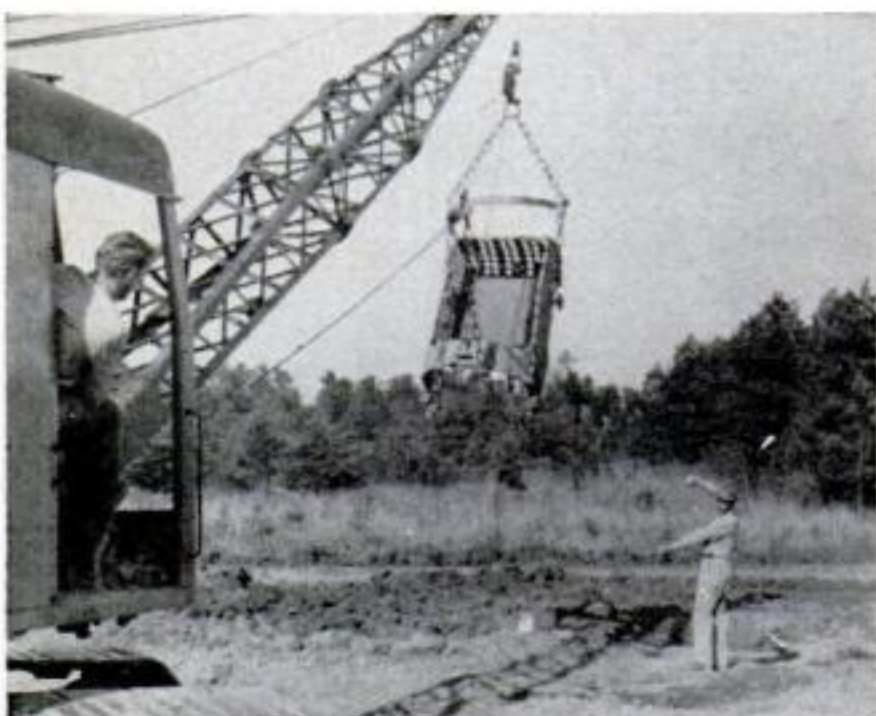
*Stop where you are*

is not turned loose for ground guidance until he has shown proficiency at controlling the machine. The man demonstrating these gestures is Sumner Willis, the school's chief classroom instructor.





**CLASSROOM LECTURES** make heavy use of charts, models and films. The school's underlying plan of instruction is to alternate doses of theory with actual practice on the machines.



**TEST OF SKILL:** Dragline student Horace Eakins is told by instructor Willis to drop his bucket so as to pick up an empty oil can tossed on the ground in the crane practice area.



**HOW OPEN IS OPEN?** Student Norman Webb learns how far open the scraper pan should be when picking up a load in one practice area. Various soils and conditions make a difference.

well for their newly acquired abilities.

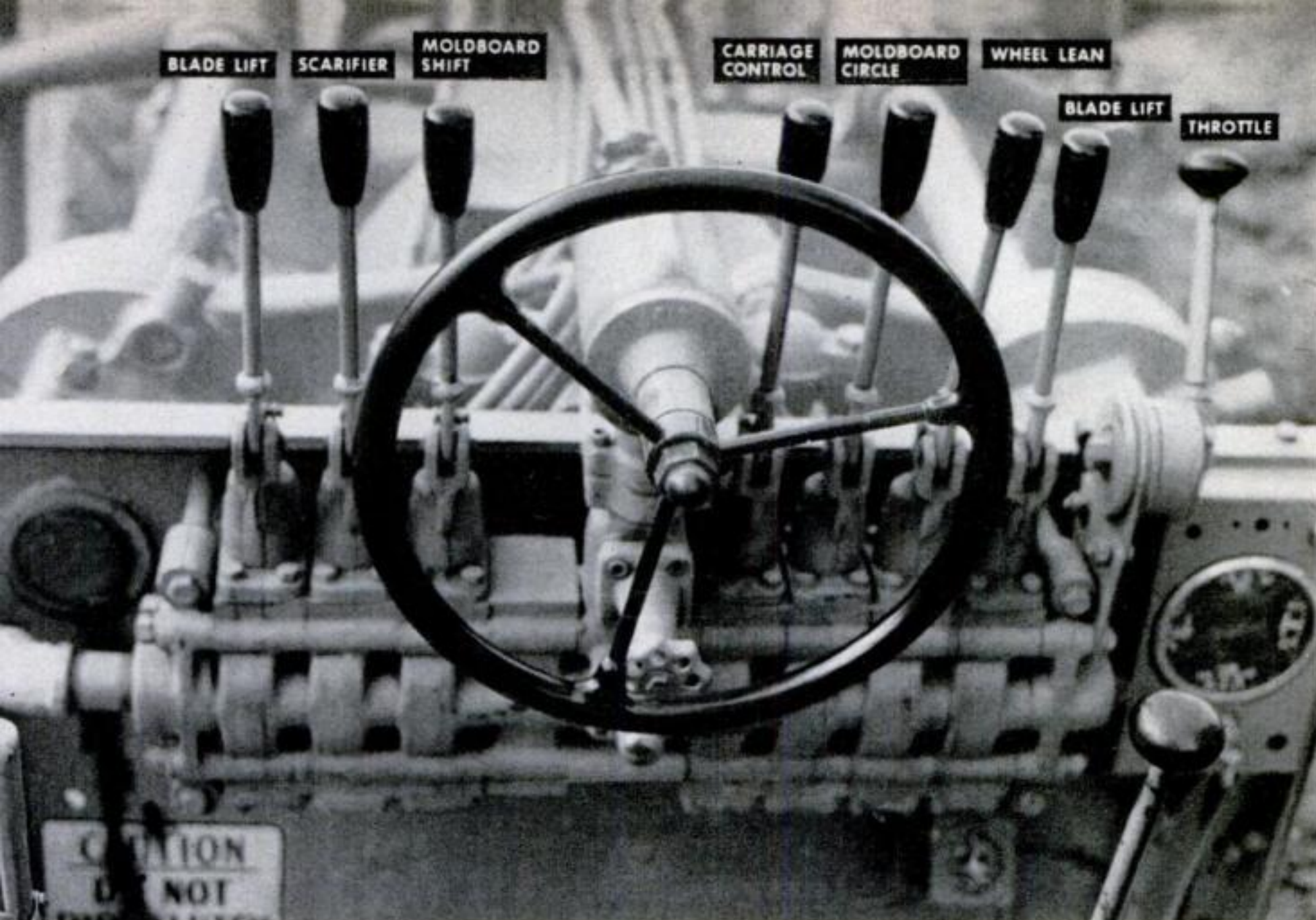
**Bachelor of bulldozers.** As sidewalk superintendents know, the deft handling of a great clanking monster verges on artistry. Many tasks take keen depth perceptions, good judgment, and precision at simultaneously nudging two or three separate controls. Contractors know it, too, from a different viewpoint: A man who can "move plenty of earth" is a real find, whereas a meat-head who tears up his machine (or a pipe or phone cable) is a major liability.

In the past, machine operators have learned the trade by a slow, informal process. A youngster might put in two years or so as an oiler and apprentice, and, if he showed promise, be allowed some after-hours practice and later a chance at simple jobs. Contractors are sometimes uneasy about this system, partly because an accident to a \$25,000 machine can stagger a bank account, and partly because a good operator is not necessarily a good teacher.

NSHEO's founder and director, a short, explosively energetic man named Gilbert S. Shaw, thinks that concentrated training is the way to produce good operators. After eyeing the way NSHEO's grads turn out, contractors are inclined to agree. Some firms have begun to send new employees to the school. No one, least of all Shaw, claims that a four- or eight-week course can teach the expert nicety that a good man perfects after years in the field. But contractors know that the graduates they hire have the basic skills, have been intensively drilled in safety and maintenance, and can "move dirt" their first day on the job.

**Fast and furious.** Going to earth-moving school is no snap; at times it's reminiscent of Army basic training. There are no educational or age requirements for admission, and students have ranged from 18 to 57 in age. Most of them are in their twenties. Each applicant has to supply character references and take mechanical-aptitude tests designed to screen out the unlikely prospects. Each student must also promise to abide by fairly strict school rules,





**MOTOR GRADER**, less showy than other earth movers, is one of the most difficult to operate.

It is festooned with controls that have to be handled precisely to get good results.

which include no smoking in class, no horseplay in working hours, and, under penalty of immediate expulsion, no gambling or drinking. Shaw, an elder of the Mormon Church, is a teetotaler.

Students live in a bunkhouse on the grounds. Weekday meals are provided in a mess hall for \$12 a week, which is the

only fee in addition to the \$300 tuition for the four-week course. (The eight-week course is \$600.) They bring along their own bedding and plenty of all-weather outdoor clothing, since work goes on whatever the weather.

At 6:30 in the morning the day begins; classroom work starts at eight; and after



**ARRAY:** among the school's machines are a tractor-drawn scraper, a motor grader, a crane and

dragline, a rubber-tired scraper, and a big tractor. In front are Shaw and two teachers.





**EMBARRASSING LAPSE** for one student occurred when his scraper wheel dropped over the soft

edge of a fill while a PSM photographer was nearby. Other students are amused onlookers.

a short lecture period, students divide up into instructor-led groups to service their machines and trundle off to practice areas. Except for a 30-minute lunch break, the air is noisy with reverberating diesels until late afternoon.

Any time lost during the 10-hour weekdays must be made up on weekends. A record is kept of each man's time on each machine, and nobody is graduated until he has logged at least his minimum time. Instructors turn in daily reports on each student, rating him not only on proficiency but also on a host of such other things as his ability to work with

others or any tendency toward "excessive" profanity.

**Book work.** Classroom lectures bear down on the adjustment and maintenance of earth-moving machines; basic techniques in cutting, filling and grading; and repeated heavy doses of safety principles. The school's motto, framed on walls all over the place, is: "The world's greatest safety device is a careful man."

Visiting experts talk on fire fighting, lube schedules and techniques when working close to pipelines, buried phone cables and high voltage. Field trips are taken to nearby construction jobs so that students can watch experienced operators at work. In total, however, lectures and field trips amount to only about a third of the program. The rest goes into practice on the big machines.

**The unglamorous grader.** Most students want to sign up for a course in running a crawler tractor or scraper or the one in using a crane and dragline. They are less likely to pick the third course—the motor grader and scraper—even after they learn that good grader men are in great demand. The reason is purely romantic: A novice likes to picture himself at the controls of a big, powerful machine. It doesn't matter that the grader is a versatile, remarkably precise mechanism, or that its operator can



**TUT TUT.** It wasn't a rough eating out, but the chances are good that from now on this student will remember that he's not supposed to leave this much slack in the apron cable.

[\[Continued on page 220\]](#)



# New in Aviation



**Atomic team** A steam catapult is about to launch a British Vickers Supermarine twin-jet fighter, capable of carrying an atomic bomb, from the aircraft carrier *Ark Royal*. The

carrier, the most modern in the Royal Navy, is designed for atomic warfare and can be run by remote control while the crew is sheltered in special compartments. It also has a mirror landing aid.



**Barrel tires** Rough or marshy ground is no obstacle to this Stinson Voyager lightplane equipped with Goodyear's new Terra-Tires. Their thin,



pliable walls, under extremely low pressure (between two and seven pounds), yield with the ground, making possible takeoffs like this water-splash one.

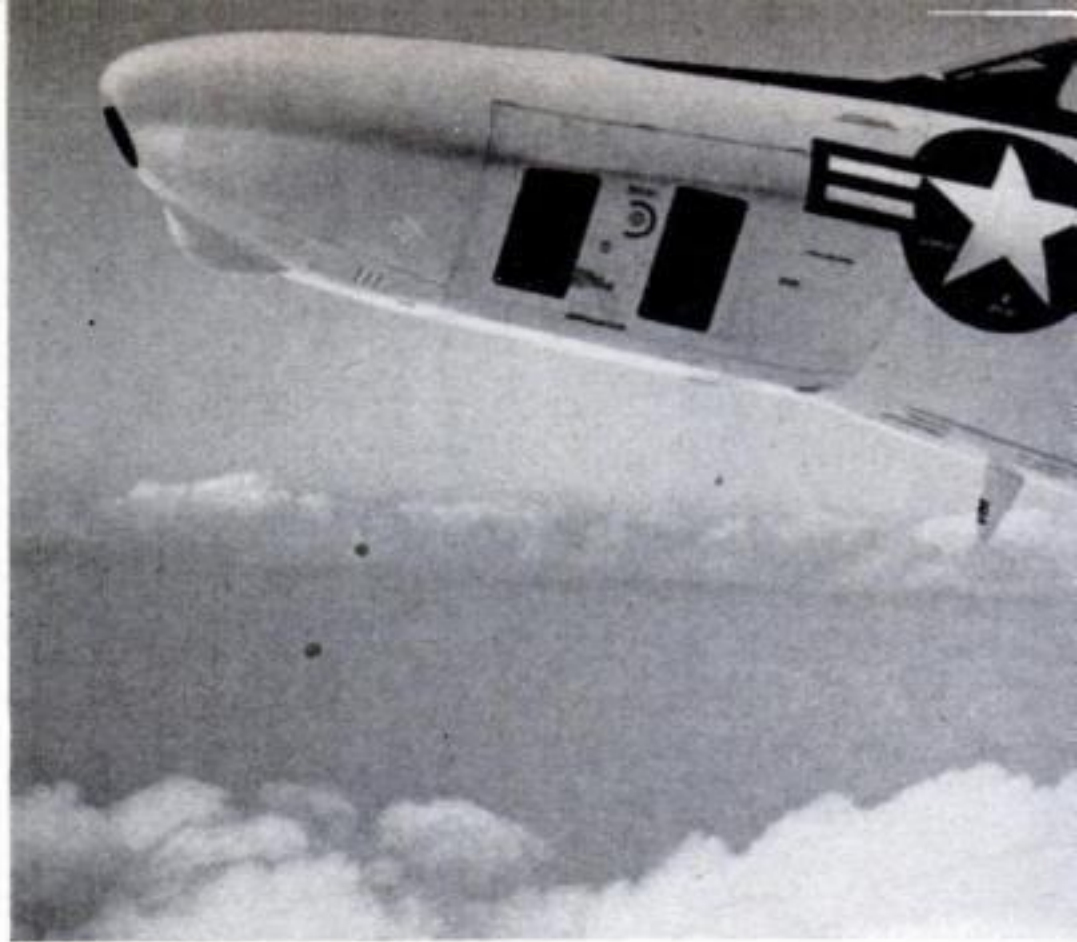
**Please turn the page for more aviation news**

AUGUST 1956 77

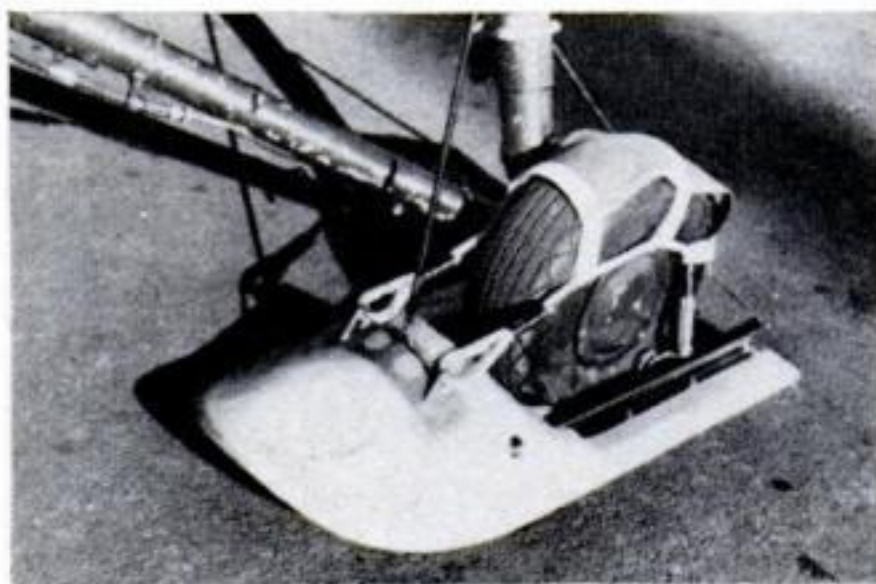


## New in Aviation

**Photo jet** This Navy supersonic Cougar (right) carries cameras that shoot through windows on the underside of its nose. The new Grumman F9F-8P swept-wing jet fighter-photo plane can photograph a continuous strip 10 miles wide while flying across the U. S. in less than four hours. Although actual speed figures are classified, an earlier Cougar model averaged 645 m.p.h. in a nonstop cross-country flight of three hours and 45 minutes.

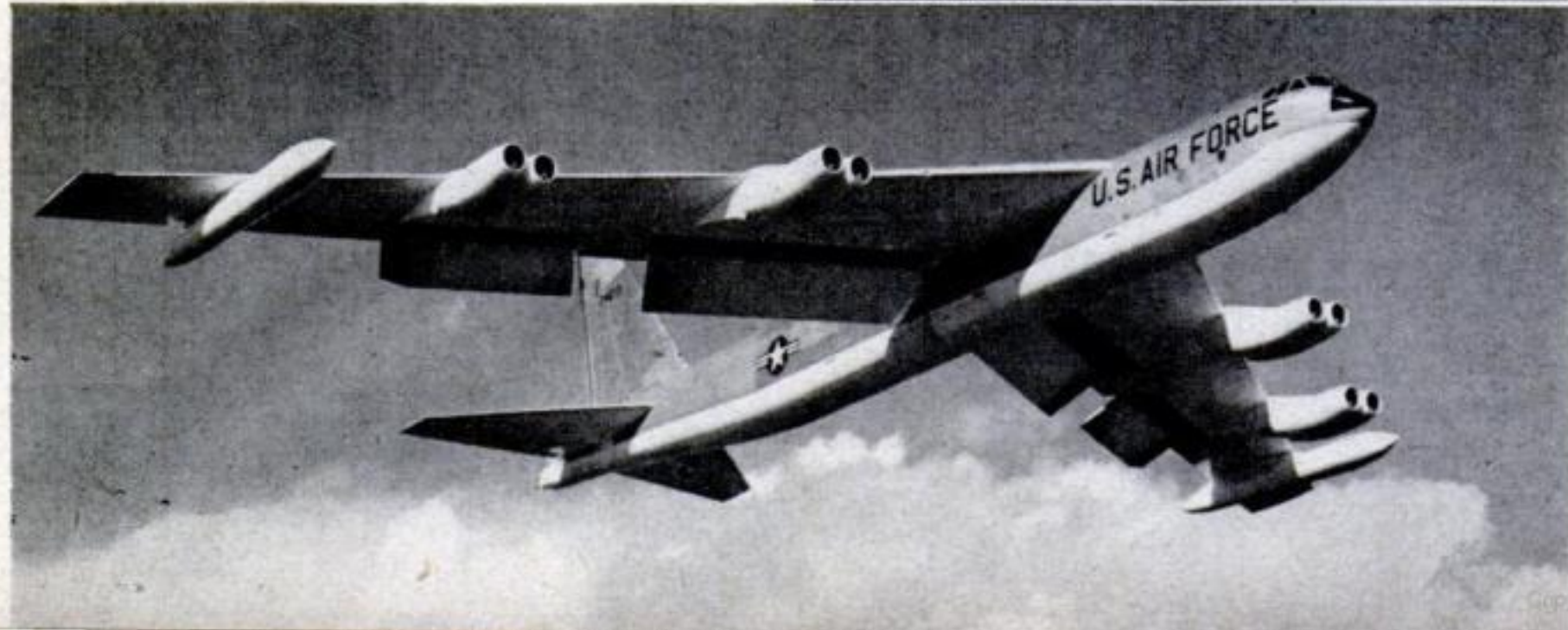


**Two-prop Piper** There are also two engines in this experimental, test-bed version of a Tri-Pacer, each harnessed to its own propeller on the same hub. The plane in the photo is flying on one engine, with the second engine and its propeller stopped.



**Landing paws** Soft ground can slew up a helicopter's landing. This boot, developed by Kaman Aircraft for its HOK-1 Marine Corps copters, gives the craft a firm foothold in snow, sand or mud. The lightweight snap-on shoes are called "Bear-Paws."

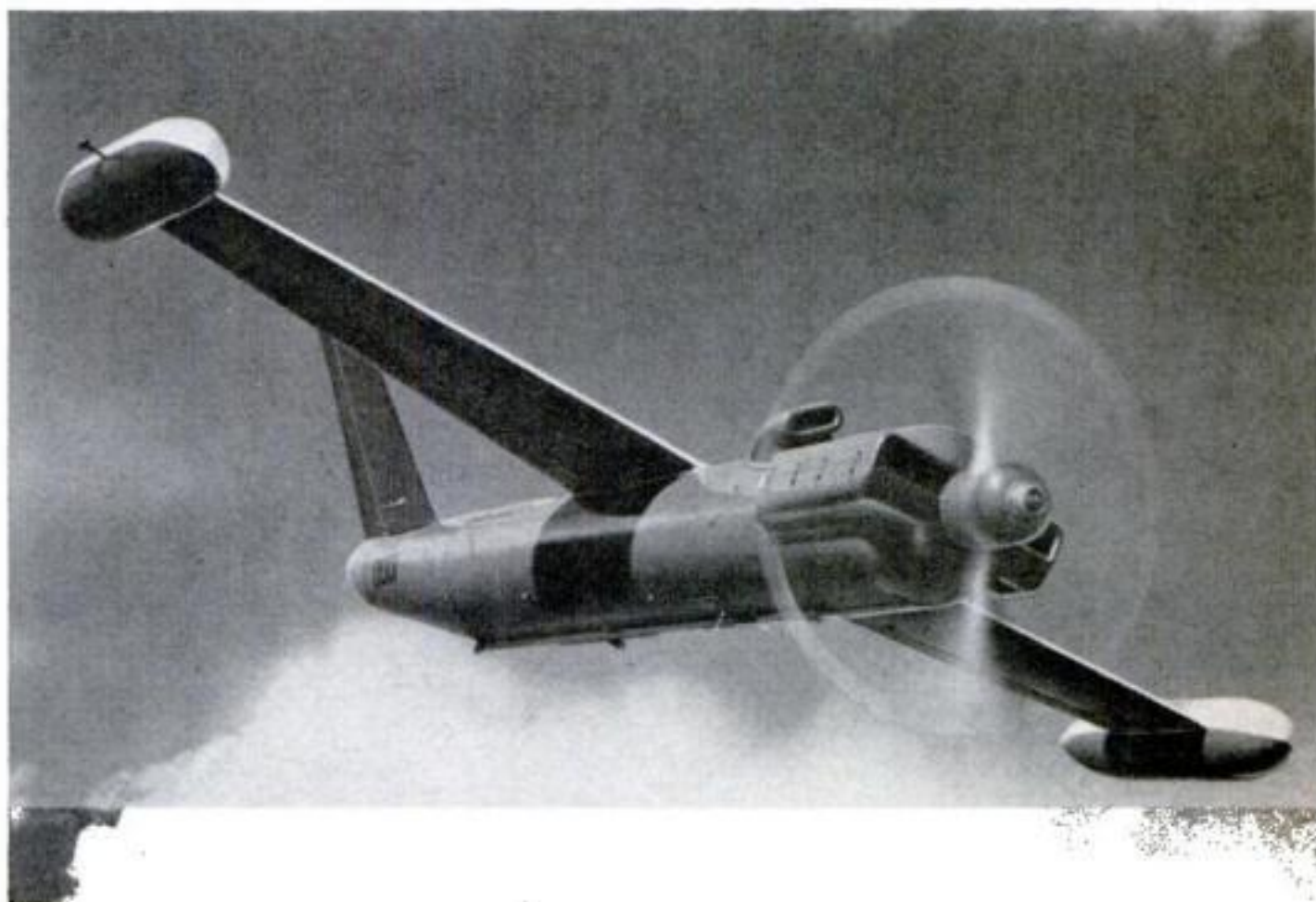
**Big tip tanks** Huge external fuel tanks, resembling miniature submarines (right), have been added to the Air Force B-52 Boeing Stratofortress to give it greater range. They are on the latest version of the eight-jet bomber, shown in flight below.





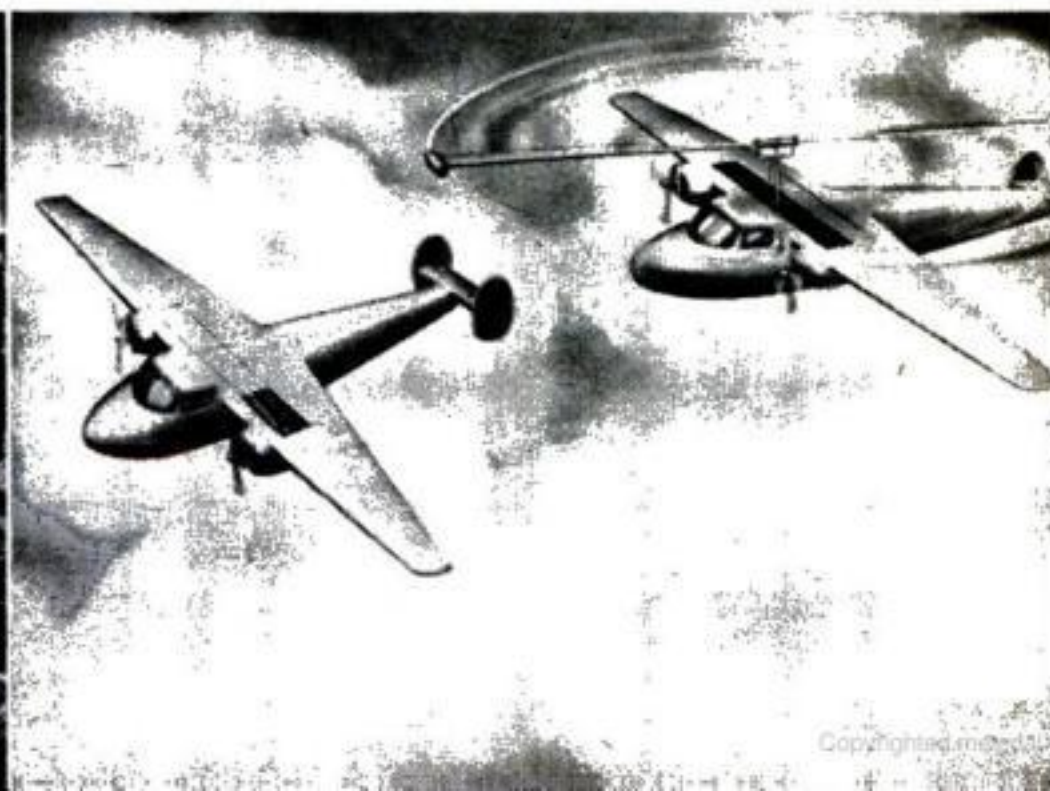


**Target** Navy gunners soon will be shooting at a new all-metal, pilotless drone. It is the Beechcraft XKDB-1, which can be guided electronically by remote control over a range of more than 100 miles. The 600-pound, 13-foot-long craft can fly 320 m.p.h. at altitudes above 30,000 feet. It is recoverable by parachute, and will float on water.



**Vertical risers** Two odd-looking birds being developed for the military are shown in these drawings. For the Army there is a tilt-wing job (below, left). Vertol Aircraft Corp. explains that the pivoting wings would be up-ended for vertical lift, swung back

into normal position for forward flight, using the same engines and props. A proposal of Hiller Helicopters for the Air Force (below, right) has a ramjet-powered top rotor blade for straight-up lift. This would fold into the wing when the conventional power plants took over.





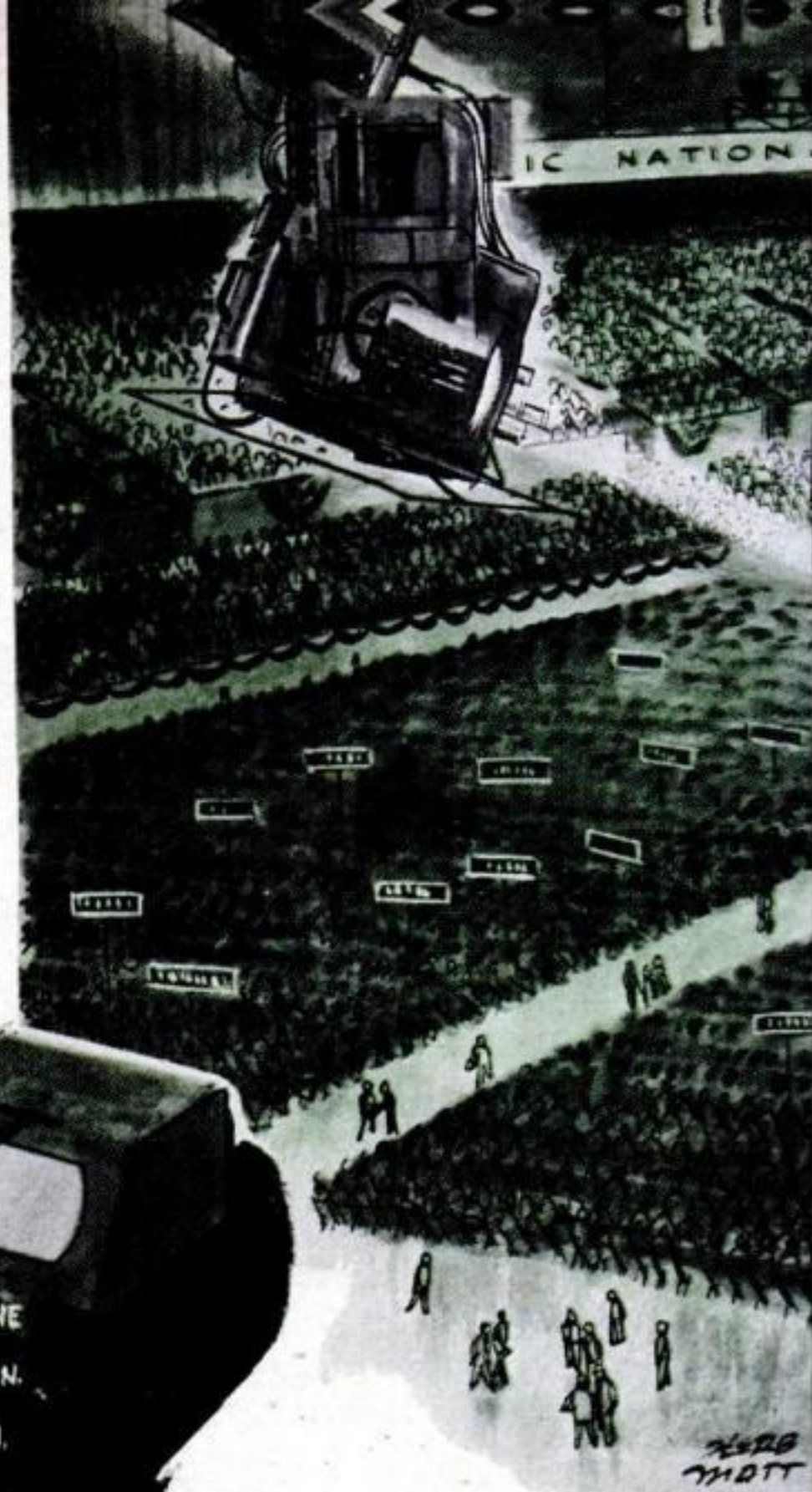
# New TV Tricks To Cover the Conventions

**Networks unveil latest devices in fight for hot news scoops to win history's largest audience.**

**By Edward D. Fales Jr.**



**SELF-AIMING CAMERAS** that zero in uncannily on any delegation will be used by NBC. A commentator will radio a call to the program director, who controls cameras by plugging contact pins into miniature floor grid.



**O**NE HUNDRED MILLION Americans will watch the political conventions this month on TV—by far the biggest audience ever assembled for any event. That's half again as many people as will vote.

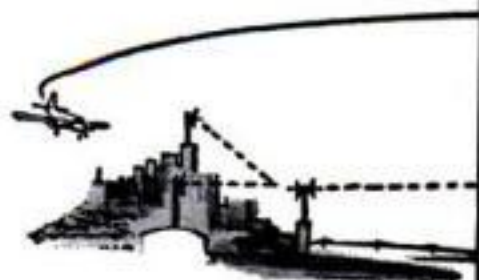
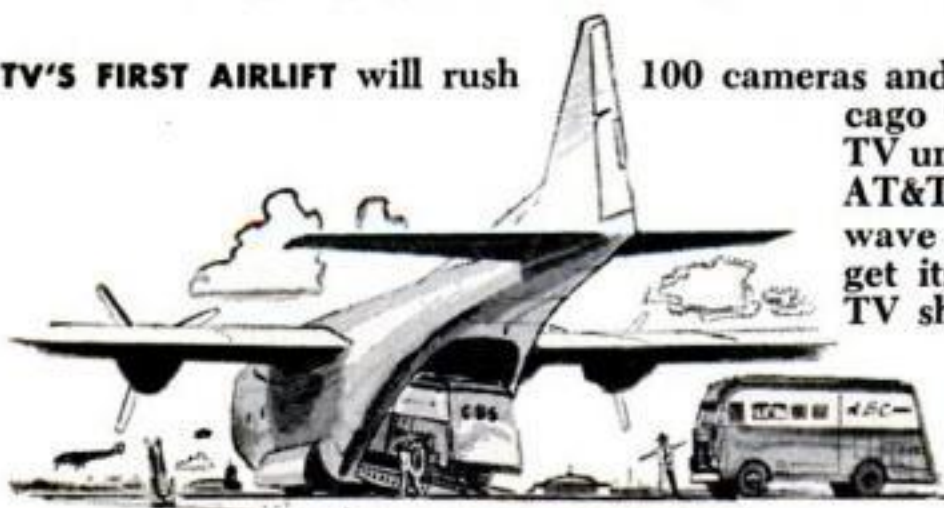
The three television networks have cooked up some new tricks to make that audience's eyes pop. The most ingenious

are previewed in the drawings on these pages, based on confidential information supplied to **POPULAR SCIENCE MONTHLY**.

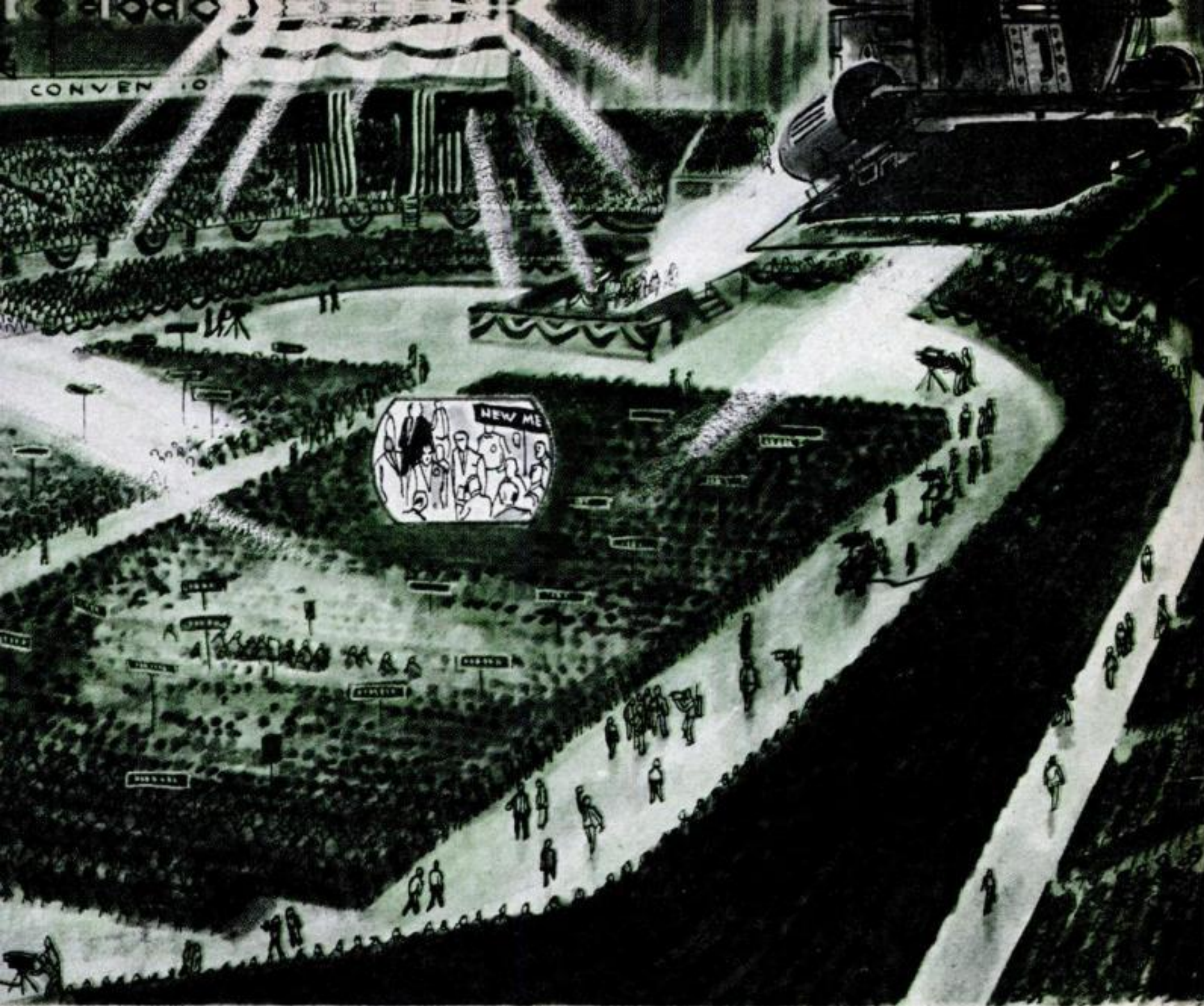
Planning reached fever heat this spring when National Broadcasting Company executives gave the word: "This year, pull out all the stops!" Top secrecy was imposed at NBC. Over at the American Broadcasting Company and the Colum-

**TV'S FIRST AIRLIFT** will rush

100 cameras and 400 personnel from Chicago to San Francisco. At left, TV units load at Chicago. Right: AT&T's new 20-channel microwave network (dotted line) will get its first heavy test relaying TV shows eastward.







bia Broadcasting System, other planners were at work, too—the kind of men who in 1952 smuggled tape recordings out of a locked-door Democratic caucus for instant broadcasting (a CBS coup).

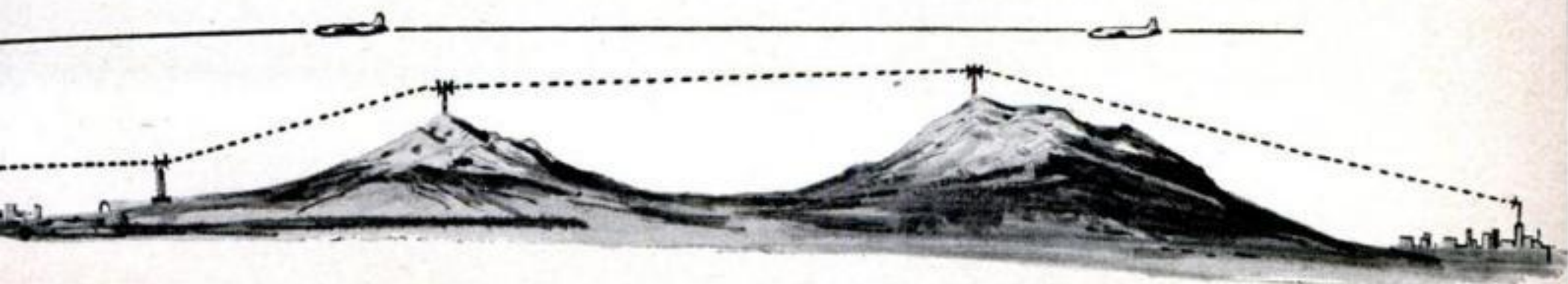
With this talent at work, you're bound to see some excitement when the Democrats meet at Chicago on August 13, followed by the Republicans at San Francisco on August 20. The technical planning alone has been enormous. Engineers moved into Chicago and San Francisco eight weeks ago. Each hall is being laced with 85 miles of inlaid video and audio wires. NBC has ringed the con-

vention halls with power outlets. Both cities have been linked to the rest of the country as never before in TV history.

But one nightmare keeps TV men awake nights. An overnight airlift will shove tons of gear and hundreds of men to the Coast as soon as the Democratic convention ends. But suppose the Democrats run into a second week and overlap the GOP? Men and equipment needed in California will then be tied up for the closing excitement in Chicago.

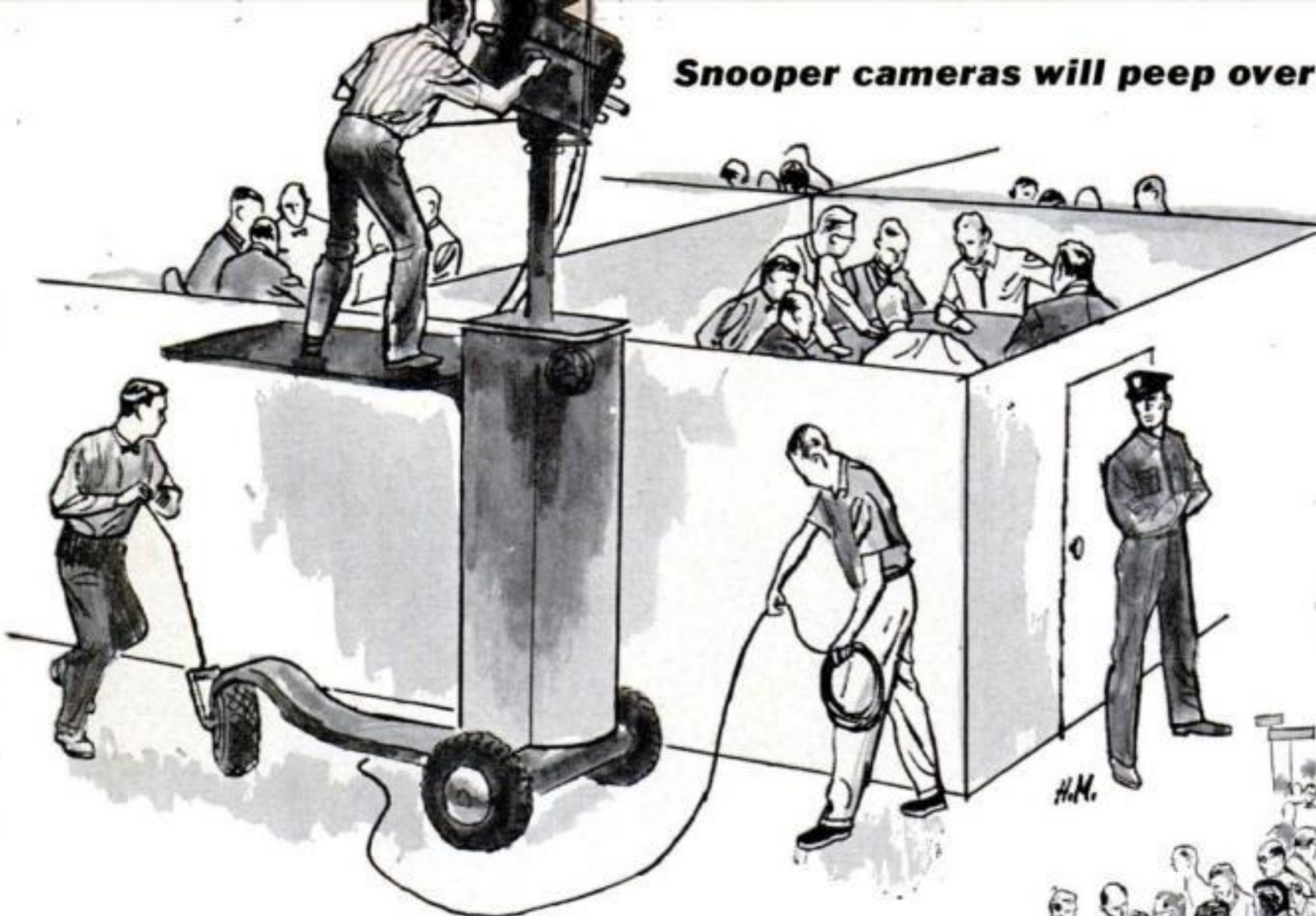
One network engineer has even figured out what to do then: "It's easy. We'll all jump into Lake Michigan."

***Please turn the page for more on TV at conventions***





**Snooper cameras will peep over walls and**



**"LITTLE SNOOPER"** is a perambulating NBC camera on a mechanical lift. It can rise to a 12-foot height for a look over the heads of crowds or even peek into San Francisco caucus rooms (which have no ceilings).

**NEW VIDICON CAMERAS** are so light that they can be hoisted on poles to look over delegates' heads. Recently put in use, they weigh only 12 pounds. Signal goes out via a light cable.



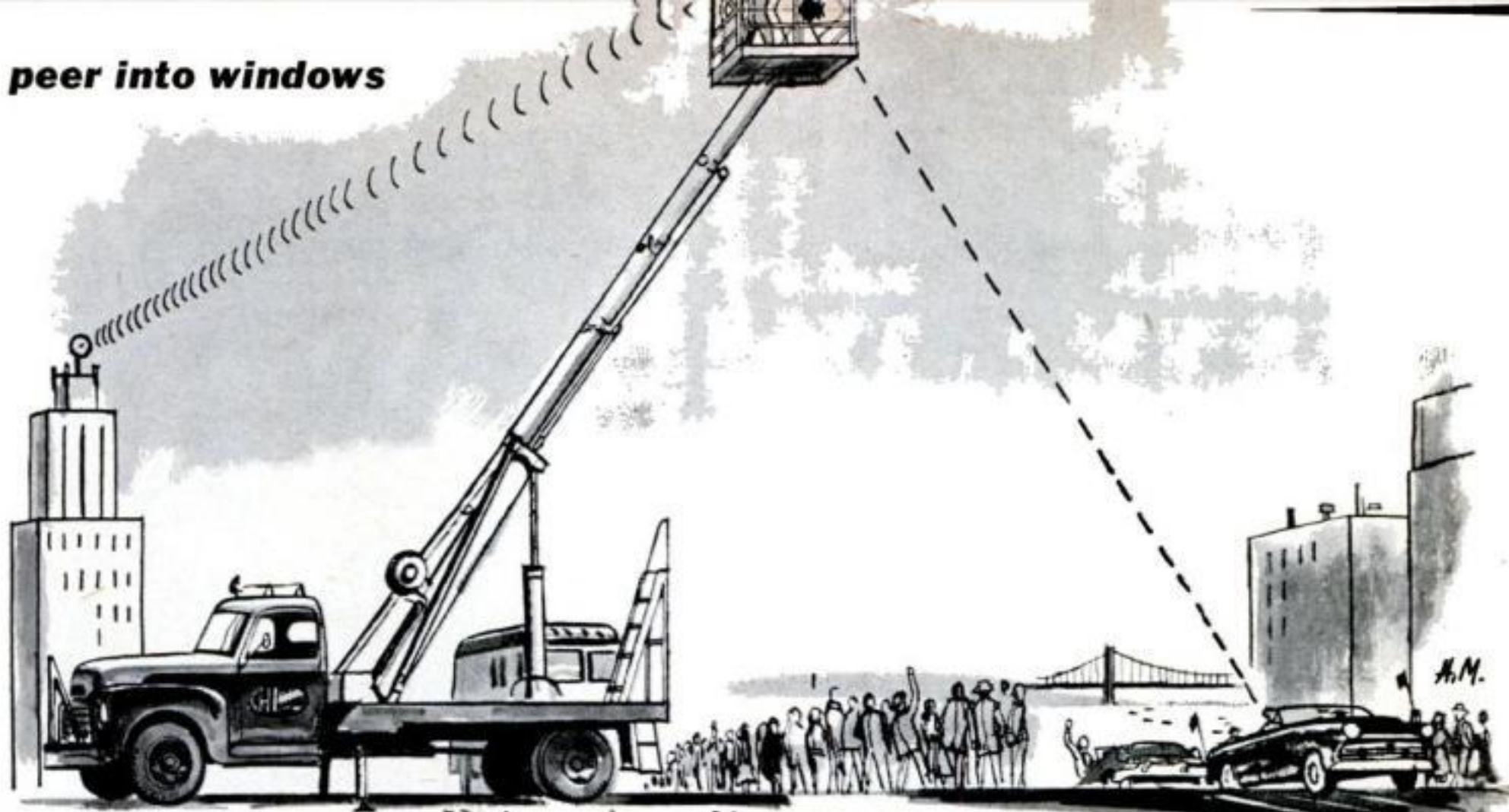
**NEW DEVICES** for NBC reporters: pocket-size radio that both sends and receives; more sensitive "creepie-peepie" camera (center); portable TV in which delegate can see himself.



**SMALLEST CAMERA** will be NBC's new pistol-grip "UP" (ultra-portable). Its viewer is the world's tiniest TV set—a built-in screen only one inch wide. This camera's signal goes out to control room via new small "pencil" cable.



## peer into windows



**SUPER-SNOOPER CAMERAS** on 70-foot hydraulic high-lift truck can broadcast while looking down on parades or, NBC says, while peeping into

smoke-filled hotel conference rooms. Video signal is relayed to a dish antenna atop building. "Elevator man" on the platform controls height.



**IF CONVENTIONS OVERLAP**, CBS says that it will split screen and broadcast both at the same time. This presents a tough problem: You may see both conventions but you will only be able, of course, to hear what is going on in one; the commentators will try to describe both.

**FLASHLIGHT SIGNAL** from floor reporter will set up a sharp black-to-white-to-black blinking on the monitor screen and tell the CBS director to swing his cameras to cover interviews.



**SCREEN SPLIT FIVE WAYS** will be used by NBC to let you see four scenes plus the commentator (in diamond inset). This invention involves no new electronic tricks. NBC will use it merely to let you see what the engineers in the control room are seeing on their monitor sets.

**BINOCULARS** will be used by ABC and CBS directors to watch for hand signals from reporters. After the wide-angle camera finds a delegation, a telescopic lens picks out the delegate. **END**







### Bike Power Runs Grindstones

His bicycle gets this itinerant British scissors and knife grinder to the job—and then helps him to do it. Here, with his vehicle propped up on wooden legs, he takes a pair of garden shears from a London housewife. Pumping the pedals turns his grinding wheels, and he's in the sharpening business.



### Car Suspension Stars on TV

WHAT goes on underneath a car as it corners sharply or bounces over a rough road? Now General Motors engineers can watch from the back seat—on a TV screen—what happens while an automobile is being road-tested. A small TV camera, belted under the front bumper (top photo) shoots the action.

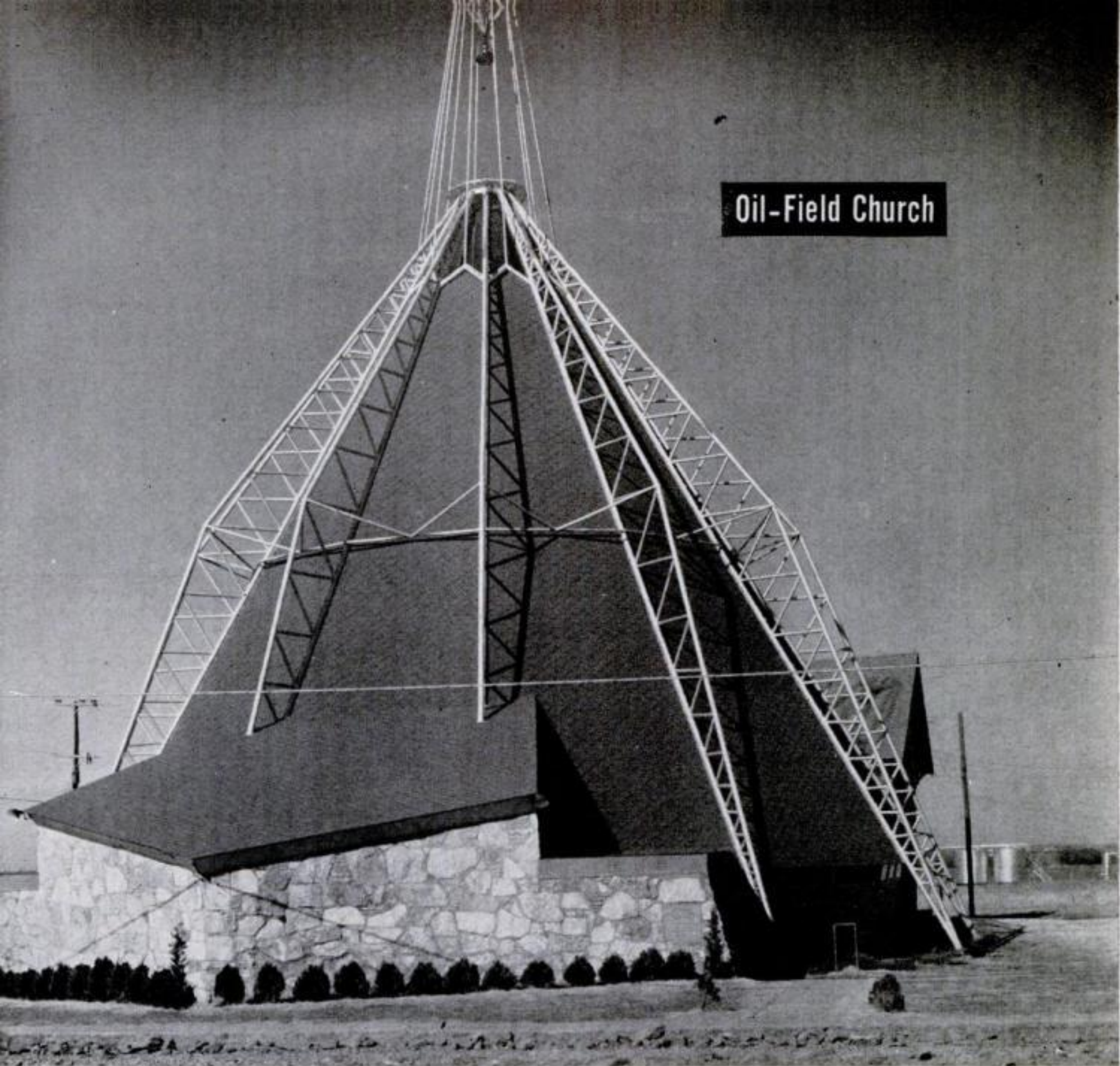


### Plastic Mulch Is Used to Protect Strawberries from Damp Rot

MOLD rot during damp weather at strawberry-ripening time can be serious for commercial growers. A new remedy is to cover the rows with a thin film of

polyethylene plastic, unrolled from a tractor, as shown at left above. Workers then cut slits over each plant with razor blades (above) and pull leaves through.





**Oil-Field Church**

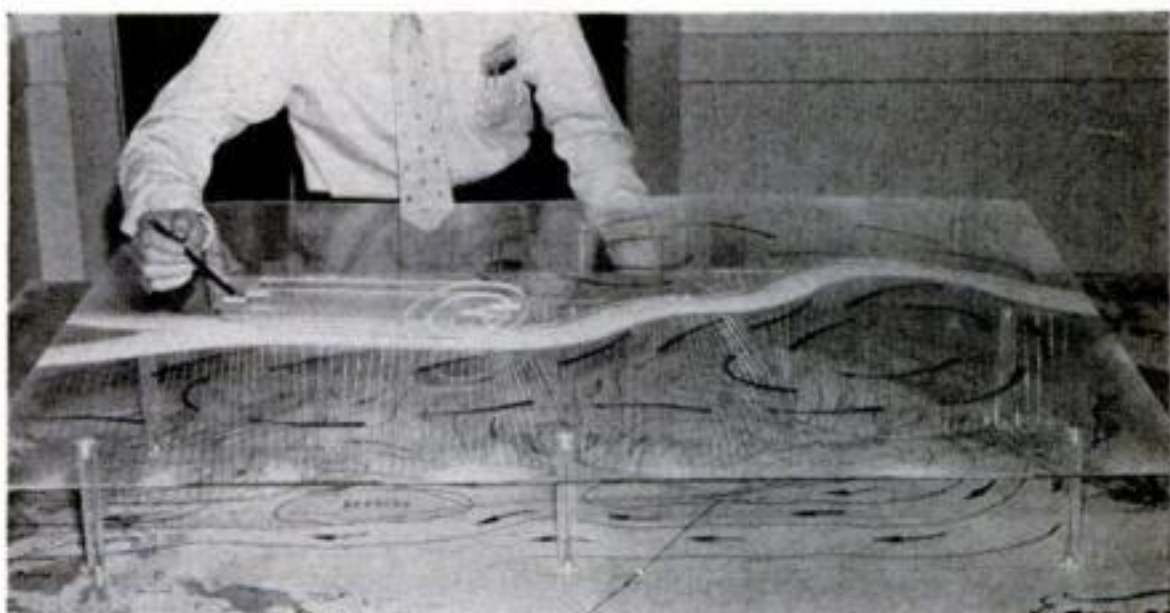
## **Oklahoma Oil Workers Build a Unique and Symbolic Church**

A **HOMEMADE** house of worship, this unusual structure takes its architectural theme from its location—the oil fields. Simple in design, the church has 12

trusses and a steeple that are made from steel drill pipe and line pipe. The building seats 300 people, and was built on a cooperative basis for \$20,000.

## **Model Traces High-Speed Jet Wind**

TO FAMILIARIZE its crews with the more-than-200-m.p.h. jet stream that blows eastwardly across the Pacific, Pan American World Airways built this plastic model. Its planes ride the big blows to fly nonstop from Tokyo to Honolulu.







**SEA WOLF**, an experimental amphibian, is used in Alaskan sections of Dew (Distant Early

Warning) Line. It makes 28 m.p.h. on snow. In water, tiny rear prop drives it at six m.p.h.

*Defying gale and ice, an army of men tackles the*

# World's Toughest



**DEW LINE** of radar air-defense warning stations across the Arctic will be backed up by the Mid-Canada Line and the Pine Tree Line.

**By Herbert O. Johansen**

**S**TRETCHING some 3,000 miles across the frigid fringes of Canada's Northwest Territories and Alaska, a vast housing project is just now nearing completion.

It is the Dew Line, our fence of Distant Early Warning radar outposts, spanning the Arctic frontier—so spectacular, so awe-inspiring, so nature-defying in concept that it has to be seen to be believed. I saw it recently on a 12,000-mile





**LIFE IS RUGGED** along our Arctic radar fence. When winds howl at 50 below, frostbite is an

occupational hazard for construction workers like this frosty tractor driver at Foxe Basin.

# Building Project

flight along the 70th parallel, during which we landed at four sites and flew over dozens of others, from Baffin Island to the northern tip of Alaska at Point Barrow.

Dew Line may cost Uncle Sam as much as a billion dollars. In the hands of private capital seeking a fair return on its investment, rents in this housing project would have to run as high as \$3,000 a month per room. But this would include radar and some with a view over the Arctic Ocean.

Why is building the Dew Line, which probably won't house more than 1,200 people when it goes into operation, so tough? The answer to that lies in the forbidding nature of the Arctic.

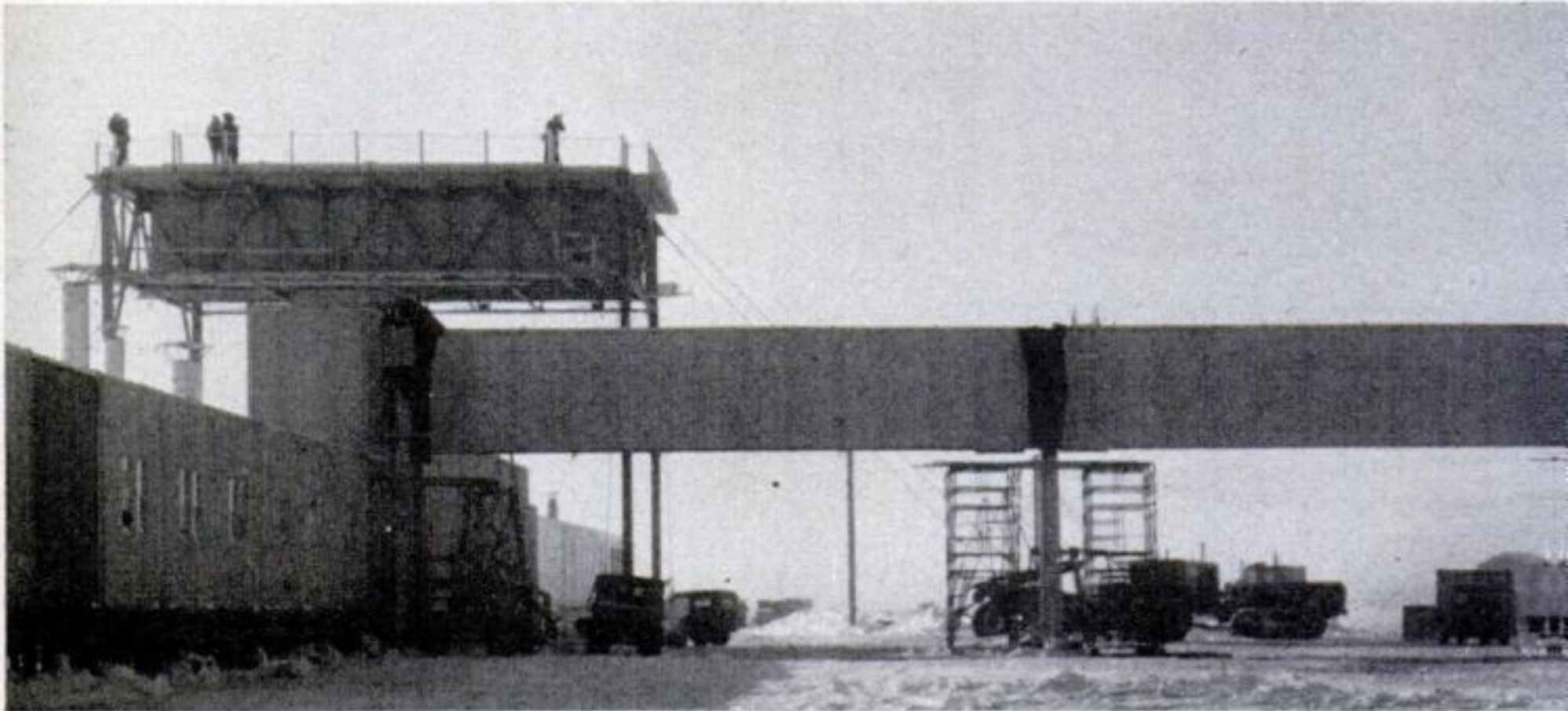
For the greatest part of the year its land and water are frozen, snow-covered wastes. There are no trees. Temperatures go down to 70 degrees below zero and howling winds of 100 miles an hour whirl snow into drifts 20 feet high. When these fierce ground blizzards subside, dreaded white-outs, in which sky and



## *Men and machines battle the Arctic*



Permafrost, several hundred feet deep, makes ordinary construction work impossible. Here



A Dew Line site nears completion. Two parallel "module trains" are connected by covered



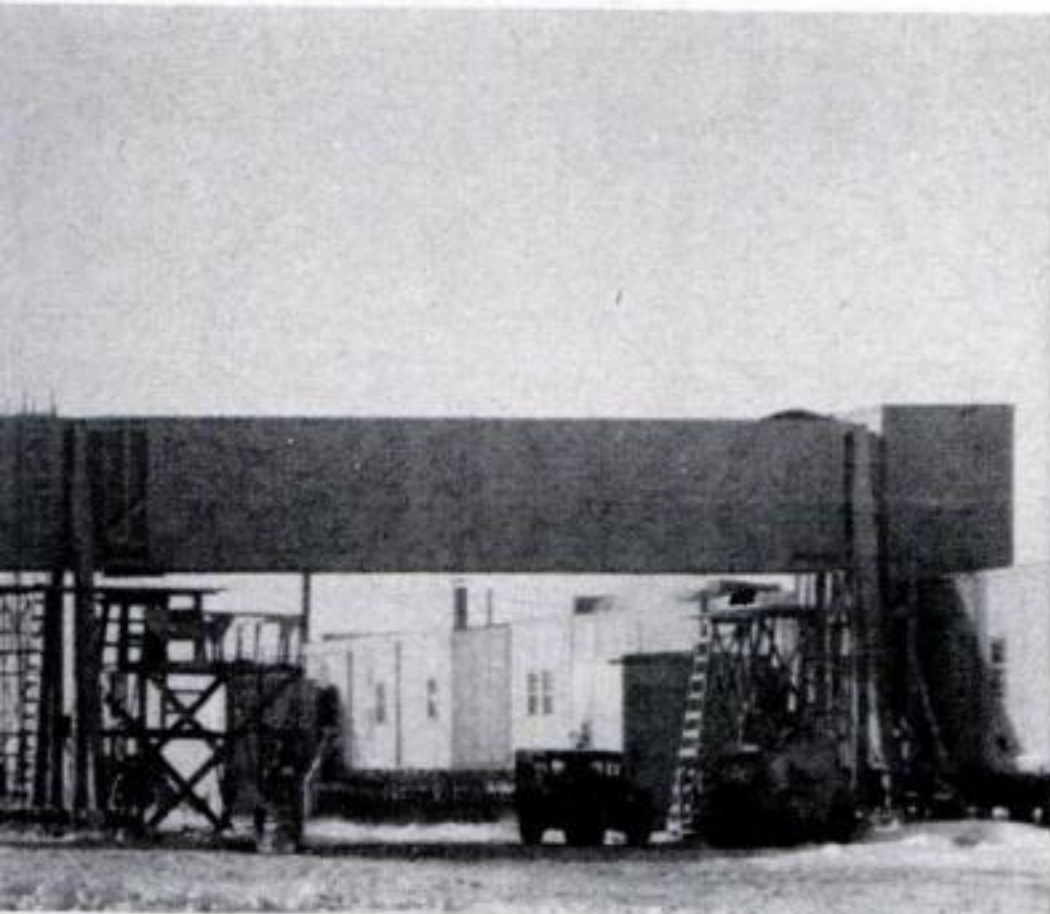
Above Arctic Circle, a huge C-124 Globemaster comes in for ice-strip landing on Victoria



to build our radar wall



hydraulic drills dig anchor holes for a tower.



bridge. Radar dome will go on platform at left.



Island in Canada's vast Northwest Territories.

snow blend, can turn everything the eye can see into a vast white nothingness.

**The ground is always frozen** to a depth of several hundred feet. In summer, this permafrost thaws a few feet down, creating a mushy bog that is, as one construction worker told me, "like walking on a bowl of jelly."

The few navigable waters unfreeze for short periods only, from a few weeks to a few months at most. And when the supply ships can come briefly in, they must crawl through uncharted waters in the wake of icebreakers, threatened by ice, fogs and Arctic cyclones.

**Into this hostile land**, when the decision to go ahead was made in late 1954, Dew Line planners had to deliver, over more than 3,000 miles, thousands of tons of construction materials, machinery and food; hundreds of thousands of barrels of bulk petroleum products and thousands of construction workers. Yet building began a few months later, using airlifted men, materials and machinery. And by the summer of 1955 the greatest sea transport job ever attempted beyond the Arctic Circle was in full swing.

There was nothing along the proposed Dew Line to start with: no local labor, except a sprinkling of Eskimos and their dog sleds; not a mile of railroad; no sea-ports; not a single road; not a foot of airstrip; no air-navigation aids.

An exception was Point Barrow, Alaska, on the Arctic Ocean, where an old Navy installation, used for oil exploration in World War II, had been reactivated. Using this installation as an assembly area, the Western Electric Co., prime contractor for the Dew Line, had built a small experimental section of the projected radar fence in Northern Alaska in 1953. The success of trial installations here proved that the impossible was possible; that an operational radar warning line could be built across the North American section of the top of the world within the crash-time limit of about three years set by the U.S. and Canada.

**Valuable how-to-do-it experience** was gained from the Alaskan trial section. Today it is paying off in keeping actual



Dew Line construction on, or even ahead of, schedule. Among other things, techniques were perfected for the erection and transportation to distant sites of the modules that are the basic building blocks of all Dew Line housing structures, most of which are expected to be completed by this fall.

These modules are boxlike architectural units, 16 feet by 28 feet by 10 feet high. They were put together along the Dew Line from factory-made, pre-insulated (fiber-glass) plywood panels designed to withstand Arctic cold, snow and wind, and for ease of assembly.

From the outside, each one looks alike. It is their inside fittings and equipment that turn them into living rooms, utility rooms, dining rooms, recreation rooms, kitchens, bathrooms, offices, "guest" rooms—and the all-important electronic rooms. The number of units (from five to 53) joined at a site to form a "module train" depends on the function.

*In the flat, tundra country* of Alaska and part of western Canada, the mod-

ules were assembled at main "factory" centers such as Point Barrow, where a natural gas well solved the heating problem. From there the prefabricated modules were loaded on sledges and hauled over the snow to Dew Line sites by 20-ton D-8 Caterpillar tractors. Sometimes these cat trains, complete with sled-borne, stove-heated, cooking and sleeping vans, known as wanigans, lumbered several hundred miles to deliver their loads. To pioneer trails across the trackless snow, Eskimos were often employed as guides. Many of the routes had to be pioneered over and over again, since drifting snow soon blankets man-made trail markers.

In the central and eastern sections of Canada, where most of the Dew Line is located, the terrain is too rugged for long overland sledding by cat trains. Many of the sites are landlocked and can be supplied only by air. At these locations the modules were erected at the building sites under huge, steel-framed construction tents.

Often a spot selected for a radar site



Eskimos and their dog sleds, shown here at Frobisher Bay, are used at many Dew Line sites.





**THE BOMBARDIER**, a personnel and cargo vehicle with skis in front and tracks at the rear, is used on the line's Canadian sections. For summer travel, the skis are replaced by wheels.



**HEAVY-DUTY TRACTORS** are Dew Line's workhorses, hauling "cat trains" of cargo sleds (above). As plows, they clear away snowdrifts to keep ice landing strips and roads open.



Landing craft, frozen in the Arctic Ocean at Point Barrow, Alaska, awaits the summer thaw.

(the highest practical elevation) could not be reached until a road was built. So modules were assembled as nearby as possible and then stored, to be ready for haulage when a road was completed.

**Selection of the sites** had to be done before any construction could start. Thousands of maps and aerial photographs were studied to establish general site areas. Pinpointing was done from planes cruising at 1,000 feet and lower, mostly in the winter and spring, during some of the world's worst flying weather.

When a site had been selected, a ski plane flew in a small crew for preliminary ground surveys and approval by a Western Electric engineer. Precise latitude and longitude were determined and a pile of rocks or a marker set up to serve as a bench mark for the first skeleton construction crew that was not far behind, blueprints in hand.

Some of the advance construction parties, landing in small ski planes, num-

bered only four men: a foreman, a bulldozer operator and two laborers. Usually their first job was to clear snowdrifts away from a stretch of frozen lake or sea to make an ice strip so that bigger planes could come in with more men, materials, machines and POL (petroleum, oil, lubricants).

**Using 67 cargo planes**, including C-46s, DC-3s, DC-4s, a Bristol, five Yorks and a B-17, Canadian commercial air carriers, by June, 1955, had completed 2,192 flights to the Dew Line camps. When ice strips began to thaw, tractors, POL and food were dropped by parachute to keep the work moving.

As work progressed, the need arose for heavier, bulkier construction machinery, including D-8 tractors that weigh up to 48,000 pounds and, for one site, a huge rock crusher. When it was found that the small planes of the civilian airlines could not handle this job, an SOS

*[Continued on page 224]*





## Generator Built Into Engine Puts Lights on Mower

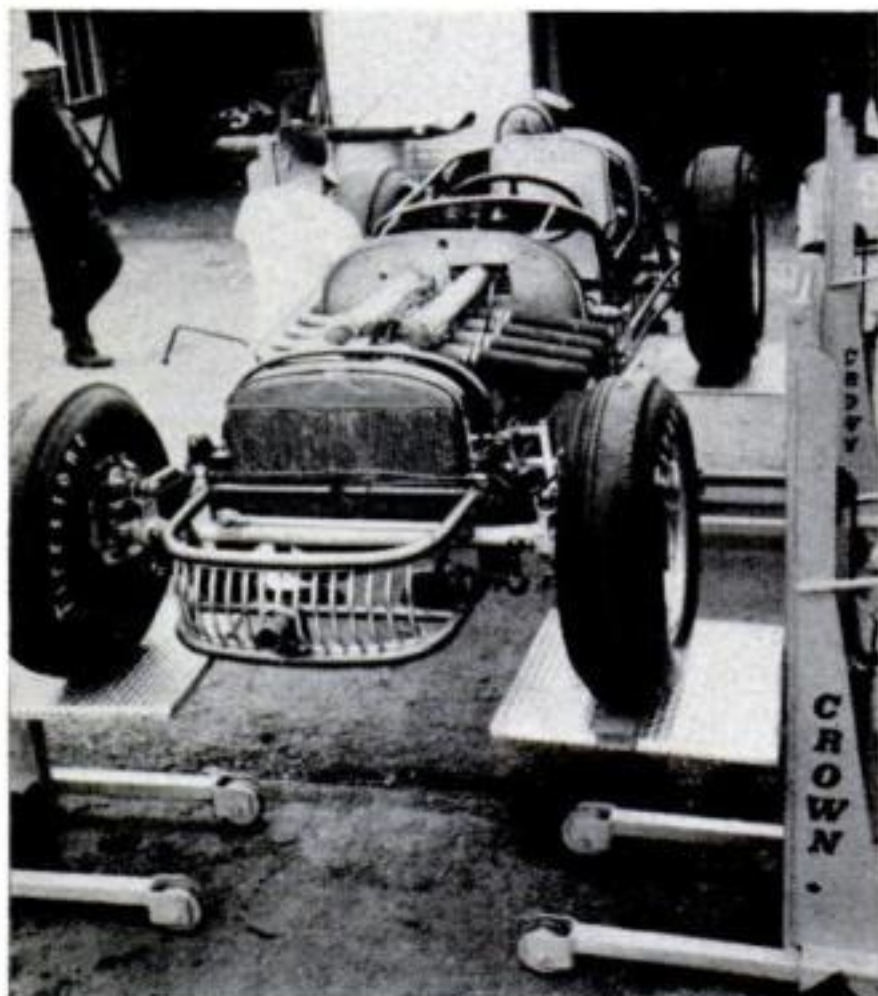
SMALL air-cooled gasoline engines with built-in generators are now turning up on power mowers, like the headlighted Red Cap at left, and on garden tractors, scooters and midget racers.

Mounted in the magneto system under the flywheel, the unit has no belts, pulleys or moving parts. It provides 12 volts at two amp. for lights and starter battery.

Syncro Corp. of Oxford, Mich., builds it with AC or DC output for two- and three-hp. jobs.

## Racer Rises for Track Tune-Up

THE pit crew of the Shannon Special parks the racing car on four hydraulic lifts (below) to make handling easier and faster. Raised to maximum height, the lifts put 54 inches between the garage floor and the car's chassis.



## Rock-'n-Roll Car Dumps Cargo

THIS German railway car hoists its cargo five feet up, then tips it to either side to empty it into a truck. Bottom-hinged side doors act as chutes. Unloading through them in sequence distributes the load evenly in the truck. A motor plugged into a rail-side power line drives the hydraulic ram and pump that put the car through its tricks.



**You'll be surprised at**

# **What Science Is Learning About Car Crashes**

**By John L. Springer**

**I**N UNIVERSITIES and other research centers throughout the U.S., scientists are studying cars, roads and drivers, trying to find ways to prevent traffic accidents that now kill about 35,000 persons a year and seriously injure hundreds of thousands more. Here are some of their startling discoveries that affect your safety on the road:

**The longer the superhighway, the greater the hazard.** On long roads, motorists get used to traveling at high speeds. They misjudge time and distance required for a dead stop, often come up to toll booths with brakes screaming. Because of this factor, Minnesota's High-



**High-income drivers go faster, crack up oftener**

**Wealthy drivers have more accidents than lower-income drivers.** The New York State Department of Health found that drivers with annual incomes of \$12,000 averaged twice as many accidents as drivers in the \$3,000-to-\$5,000 bracket, three times as many as drivers with incomes under \$3,000. The well-to-do also drive faster, this study found. Drivers earning \$3,000 a year averaged 47 m.p.h. on open roads. Those earning \$5,000 to \$9,000 averaged 53. Big-money (over \$12,000) drivers zipped along at 55.

**High-altitude driving is extra-dangerous.** A stretch of U.S. Highway 66 in New Mexico, 6,500 feet above sea level, had a fatal accident rate twice the national average. Traffic engineers of the University of California established that at this altitude some drivers breathe more deeply to get



**Mountain air can make you drowsy**

way Department found, more crashes happen on sharp curves after long straight roads than on similar curves after short stretches.

enough air. Their pulses quicken, hands begin to quiver. They also get sleepy and headachy, their vision is impaired, and their reflexes slow down noticeably. All





**A timetable may lead you to take chances**

these factors tend to breed accidents.

**How you plan trips may cause a crash.** Dr. Heinz Haber of the University of California says that many drivers decide to cover almost superhuman distances on a long trip, or to better a previous record. Instead of stopping after a good day's driving, they push on, and become prospects for the accident ward.

**Setting up a timetable for regular trips is hazardous.** Say you make the same hundred-mile journey frequently. Your tendency, Haber says, is to allow the shortest time required in the past. When delays occur, you'll try to get back onto your timetable by increasing speeds, taking more chances—and courting disaster.

**Billboards help prevent accidents.** Dr. A. R. Lauer of Iowa State College's Driving Lab found that advertising signs along the highway arouse the motorist, keep his mind active and ready to act quickly in an emergency.

**Most fatal accidents involve cars traveling straight ahead.** Analyzing a year's accidents, the Travelers Insurance Company found that cars headed straight caused five times as many deaths as cars moving in all other directions combined. The big killer is that unexpected crisis that seemingly pops up from nowhere.

**Cars legally parked on highways help trigger accidents.** Oregon's Highway Department studied how drivers

react when they pass cars parked off the road. Few slow down. Most swerve out—often cross the white line even when cars are approaching them, thus risking head-on crashes.

**Drivers who gloat over their safety records may be riding for a fall.** Dr. Ross A. McFarland of Harvard's School of Public Health says that the average driver causes three to

five serious accidents per lifetime. The typical driver who has not caused an accident for a long time grows cocky and careless. He takes longer chances. Eventually there's another accident.

**Steady drivers have steady jobs.** Dr. Leon Brody of New York University's Center for Safety Education found that persons who switch from job to job get involved in more traffic violations than



**Billboards help keep motorists alert**

those who have held the same job for five years or longer.

**A "one-track mind" may handicap drivers.** It's an asset IF they concentrate on driving. But if they think of something else, watch out! Dr. G. R. Wendt of the University of Rochester, gave a driver a drug—pyrahexyl compound—that increases powers of concentration. The driver drove off with an observer, started talking and shot past flashing blinker lights at a railroad crossing while a train came roaring down the tracks! He made it.

**Knowing all the traffic laws does not**

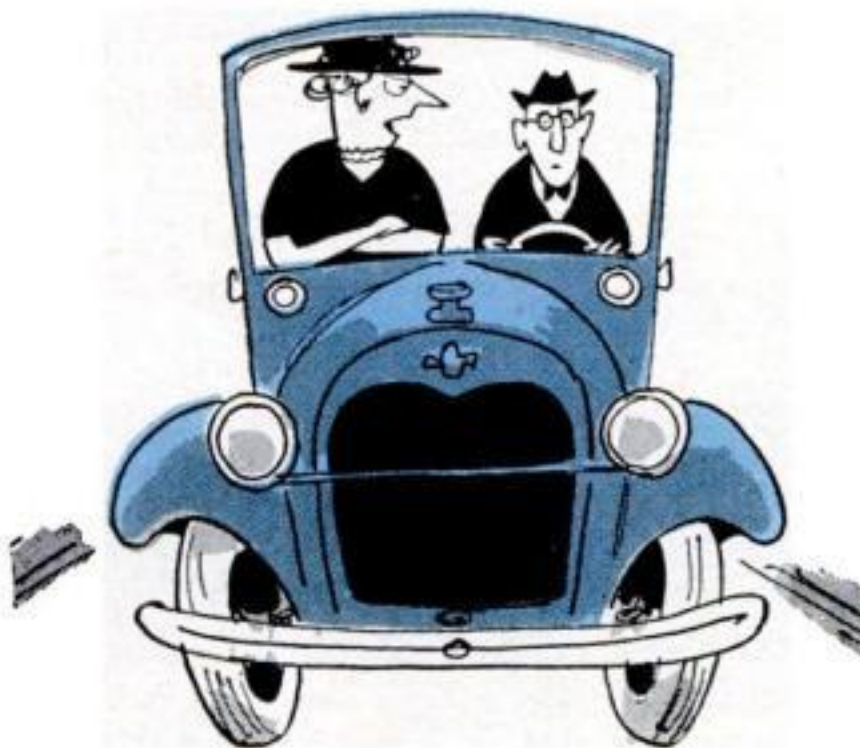


**necessarily make you a better driver.** In a New Jersey survey, 88 percent of traffic violators scored 80 percent or better in a "Traffic Knowledge Test." They knew how to drive safely, but simply ignored the rules.

**Carbon monoxide is a greater killer than you probably realize.** Vermont researchers spot-checked new and old passenger cars, found that one in 25 had enough CO—motor exhaust fumes—to cause headaches and drowsiness over a long driving stretch. Some cars have concentrations great enough to make drivers light-headed, fuzzy-brained, unable to think clearly in emergencies. Dr. David B. Dill of the Army Chemical Center, Maryland, proved that CO can bring a person to the verge of collapse without his realizing it. Always drive with a window open, and don't smoke a lot—it raises your blood's CO level.

**Married motorists drive more safely than single ones.** The New York University studies, covering good and bad drivers, revealed that 93 percent of the good ones were married, but only 69 percent of the chronic traffic violators.

**Front seats are most dangerous only at slower speeds.** In sudden stops from high speeds, passengers anywhere can be thrown into objects that can kill them,



**Married men break fewer traffic laws**

an Indiana State Police study has found.

**Drivers and passengers suffer different types of injuries.** University of California researchers say that passengers are more likely to get dislocations and sprains; drivers get more fractures. Head injuries cause most highway deaths.

**"Perfect" roads are risky.** They don't give drivers enough to do, high-



**Excessive smoking boosts carbon monoxide in blood**

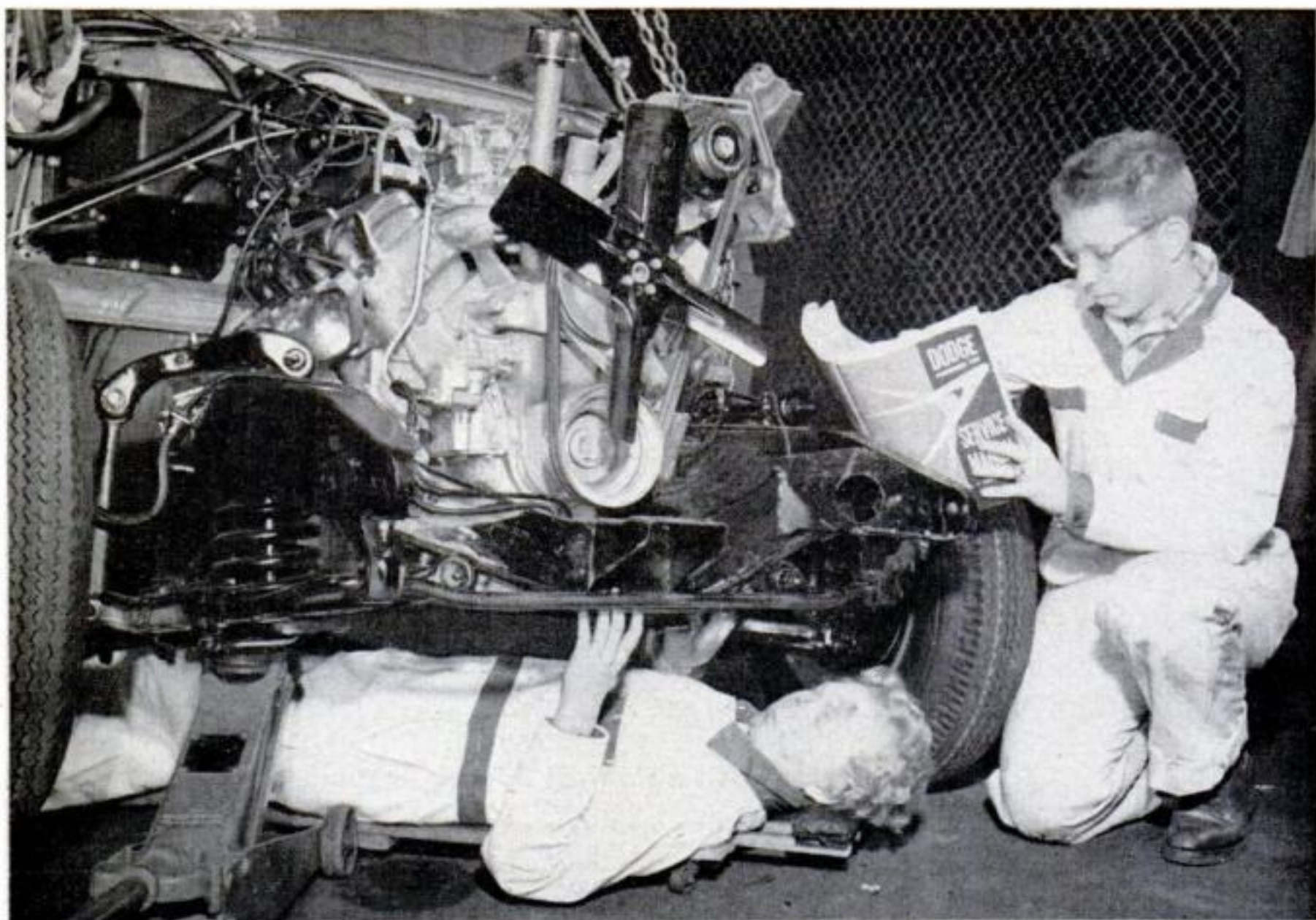
way experts have found. Result: monotony, a slowing down of reflexes. The New York State Thruway runs through long stretches of straight, flat land. Its designers marred the "perfection" with gentle curves to keep drivers alert.

**Non-drinkers have a higher accident rate than the drivers who do drink.** So New York State researchers learned; a possible explanation being that physical ailments like heart trouble that may affect driving efficiency are also the reason why many motorists do not drink. Of course, motorists who drink before they drive have more crashes than teetotalers.

**"Passing bays" curtail accidents on two-lane roads.** Even conservative motorists following trucks up hills sometimes risk smashups by passing. Side lanes—"passing bays"—enable trucks to pull over temporarily and continue at snail speeds while cars pass safely.

**Modern cars may make drivers too comfortable for safety.** Dr. Haber argues that before cars had balloon tires, power steering, power brakes, heaters, etc., the driver became so tired physically that he quit while still mentally alert. Now he tires mentally and psychologically first, which contributes to crashes. **END**





**THE BLONDE ON THE CREEPER** is Jackie Carte, busy with the ratchet wrench while Jim Porter checks details in the service manual. Working space was rented in a Wyandotte factory.

## Junior Mechanics Assemble a 230-Horsepower Car

**T**WO DOZEN teen-agers from Wyandotte, Mich., recently built a 230-hp. sedan as a Junior Achievement project and then promptly sold it for \$3,600. Christened the "Royal Achiever," the blue-and-gold automobile was built chiefly from Dodge parts obtained from the factory. The only part of the job that the 12 girls and 12 boys didn't do by themselves was final front-wheel alignment. Each kid spent about 60 hours on the job.

After the car was completed and sold, its young parent company was liquidated. All debts were paid with interest; all stockholders got their capital back with a 20-percent dividend; and all the employees were paid 10 cents an hour plus a \$50 bonus.



**THE GANG** eases the body down off the truck that brought it from the Dodge plant. Expensive tools like chain hoists and garage jacks were either borrowed or rented for the job.



**SAD FAREWELL** occurred when the finished and gleaming car was sent off to its purchaser, a Detroit advertising man. The car was okayed by a regular factory inspection crew.



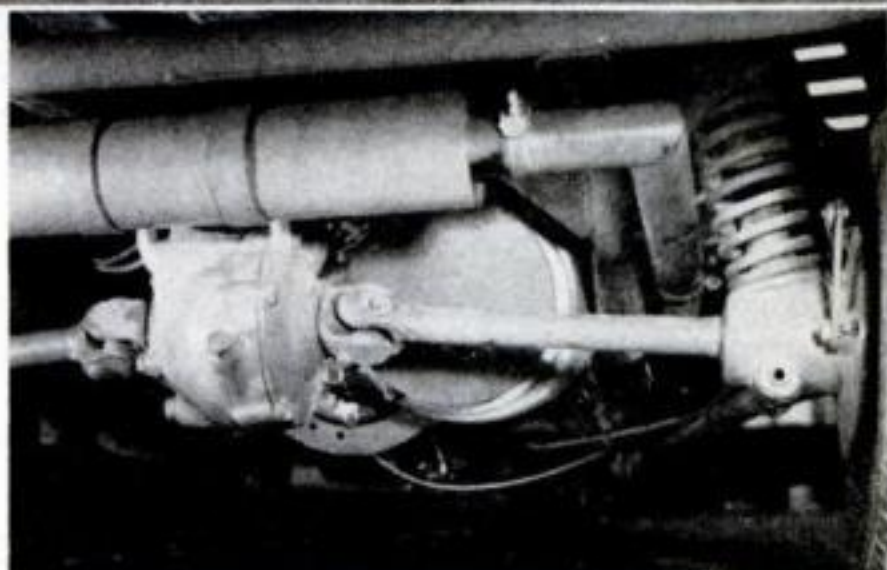


## Want a Three-Wheeler? Here's a U. S. Version . . .

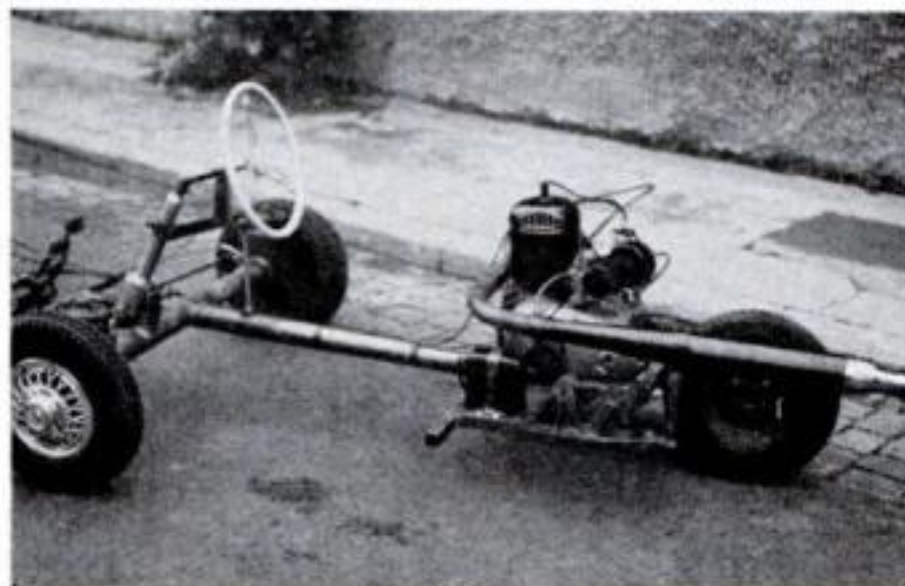
A SPANKING-NEW three-wheeled car—with styling that ought to turn Detroit green—has just made its debut. It has a plastic body, a one-lung, two-cycle engine (lower right)—and twin exhaust pipes! Top speed is about 70.

That's only the half of it. Look: independent rear-wheel suspension (upper right), hydraulic brakes, disk wheels, an airplane-type steering wheel and a 12-volt electrical system.

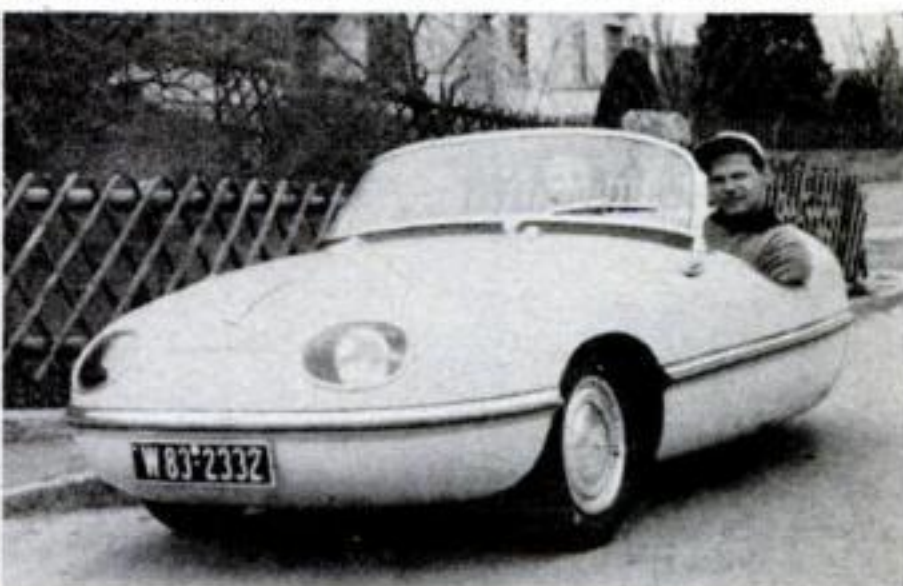
And the price? It's not cheap—just a thin paper dollar short of \$1,000. New York-built, the car is called the Bassons Star and as yet exists only in prototype. Manufacture is scheduled soon. The Star's third wheel is in front. For a German tricycle job, with the third wheel behind, take a look below.



## . . . and a German One, a Fiber-Glass Egg that Goes 60 M.P.H.



THREE wheels, a tubular-steel backbone, and an air-cooled one-lung engine make up this German Bruetsch. Two- and three-seater versions with several engine



options sell abroad for as low as \$400. With a 250-cc. engine of 15 hp. and a four-speed transmission, the plastic-bodied tricycle can hit about 60 m.p.h.





**PORTAGE** is no problem. Made of fiber-glass, the midget scooter is light enough to be carried easily by one man.



Water-scooting at eight miles an hour. The throttle is located at right side of the handle bar.

## Water Scooter Serves Frogmen

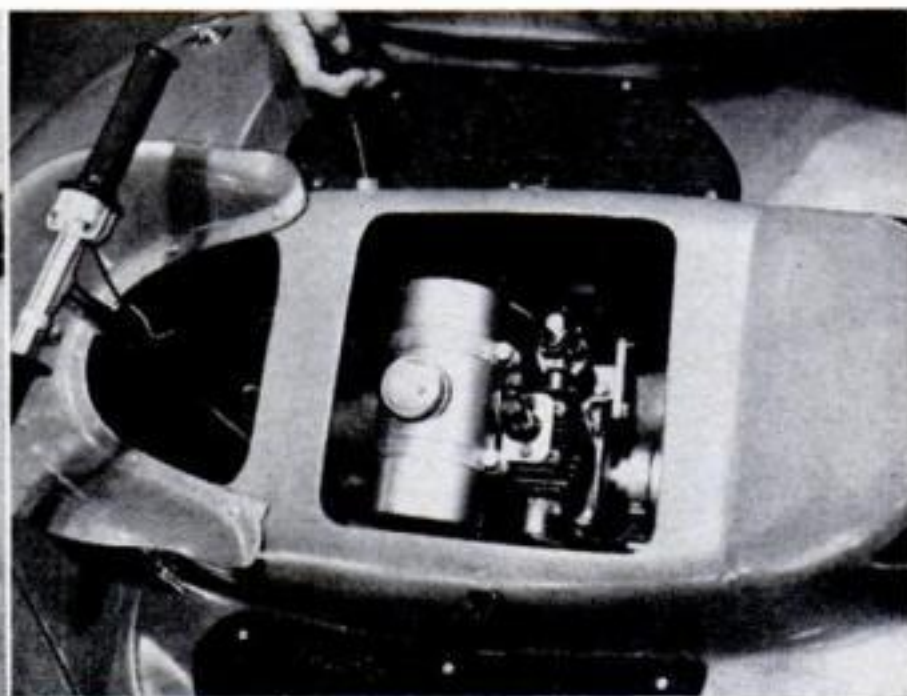
**S**WIMMERS and skin divers are hitchhiking on the West Coast these days—and adding thrills to their water sport. What they hitch to is a 1½-horsepower water bug imported from Germany.

Operating for six hours on a quart of

gasoline, the 65-pound marine mite can be ridden standing up as a self-powered surfboard; sitting, for commuting from beach to beach; and at the end of a tow rope by skin divers, who can save their strength by not having to swim to their



**SNUG FIT** in the trunk of a car, the Wave Roller is 59 inches long and has a 36-inch beam.



**COMPACT ENGINE** is covered with a pad on which pilot sits astride. A cable pull starts it.





**WITH THE ENGINE SHUT OFF**, the bantam boat makes a handy floating base for skin divers.



**SKIPPER TOSSED?** In that case, the throttle automatically cuts to idle and the rudder swings hard right so that the boat circles slowly as the pilot climbs aboard again from the rear.

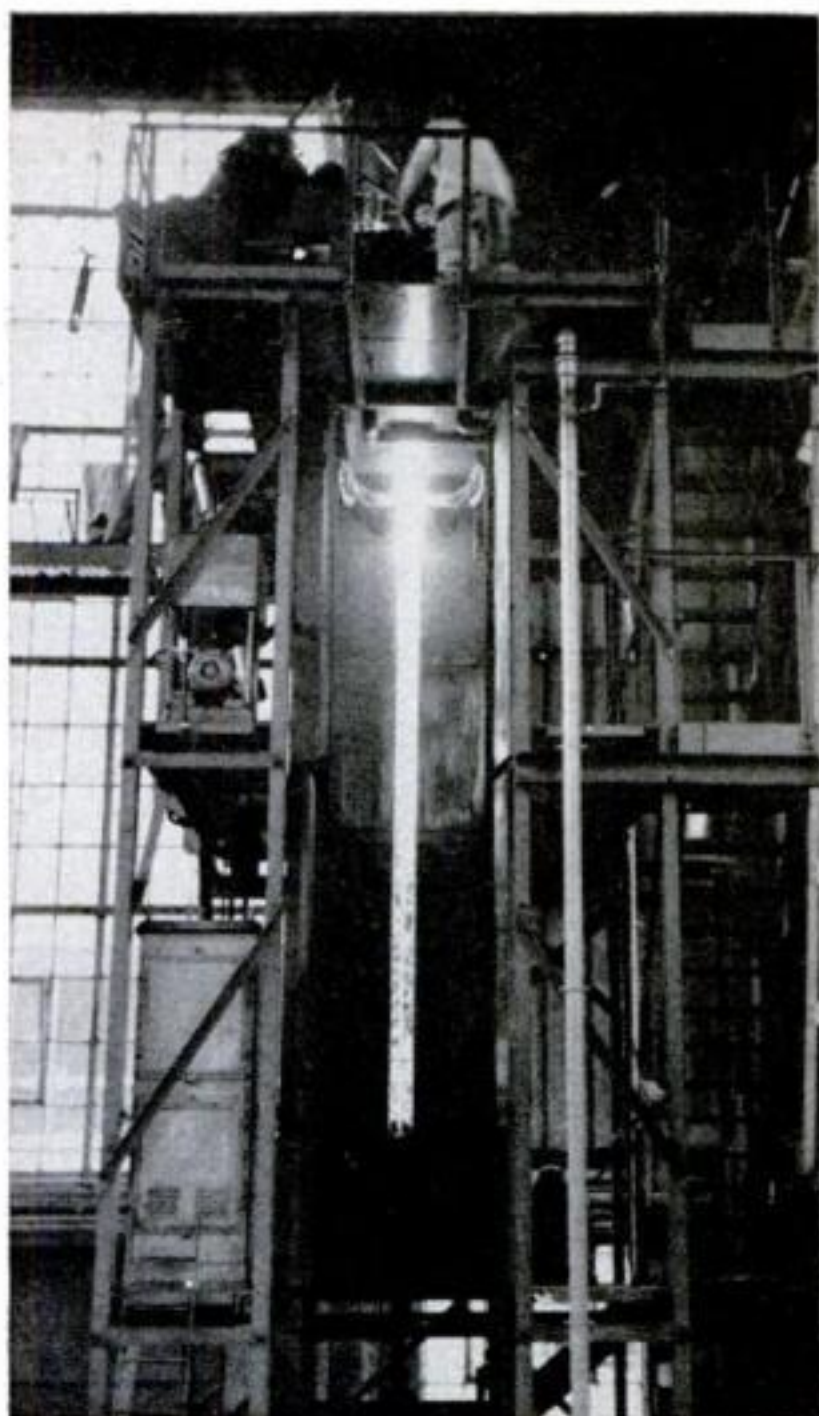
## as Diving Raft

favorite hunting spots. Air-filled fins keep the craft from capsizing in case the cockpit becomes flooded.

The Lepel Wave Roller, distributed by Sheldon-Raymond, 770 St. Louis Ave., Long Beach, Calif., sells for \$325.



**TOW BOAT:** Members of Los Angeles Neptunes, a skin-diving club, get a ride to diving area.



## Molten Metal Falls into Solid

A METHOD of continuous steel casting has been developed by a Sheffield, England, plant. Molten metal is poured into a cooled six-inch-square mold at the top of a 20-foot tower. As the metal column emerges, it is further cooled by water sprays, and cut up.



## New Austin Six Will Do 95

A TOP speed of 95 m.p.h. distinguishes this new British Austin A-105. Its 103-hp., six-cylinder engine has twin carburetors and 8.25:1 compression. Overdrive and a four-speed gearbox are standard. Halves of its front split seat are adjustable individually.

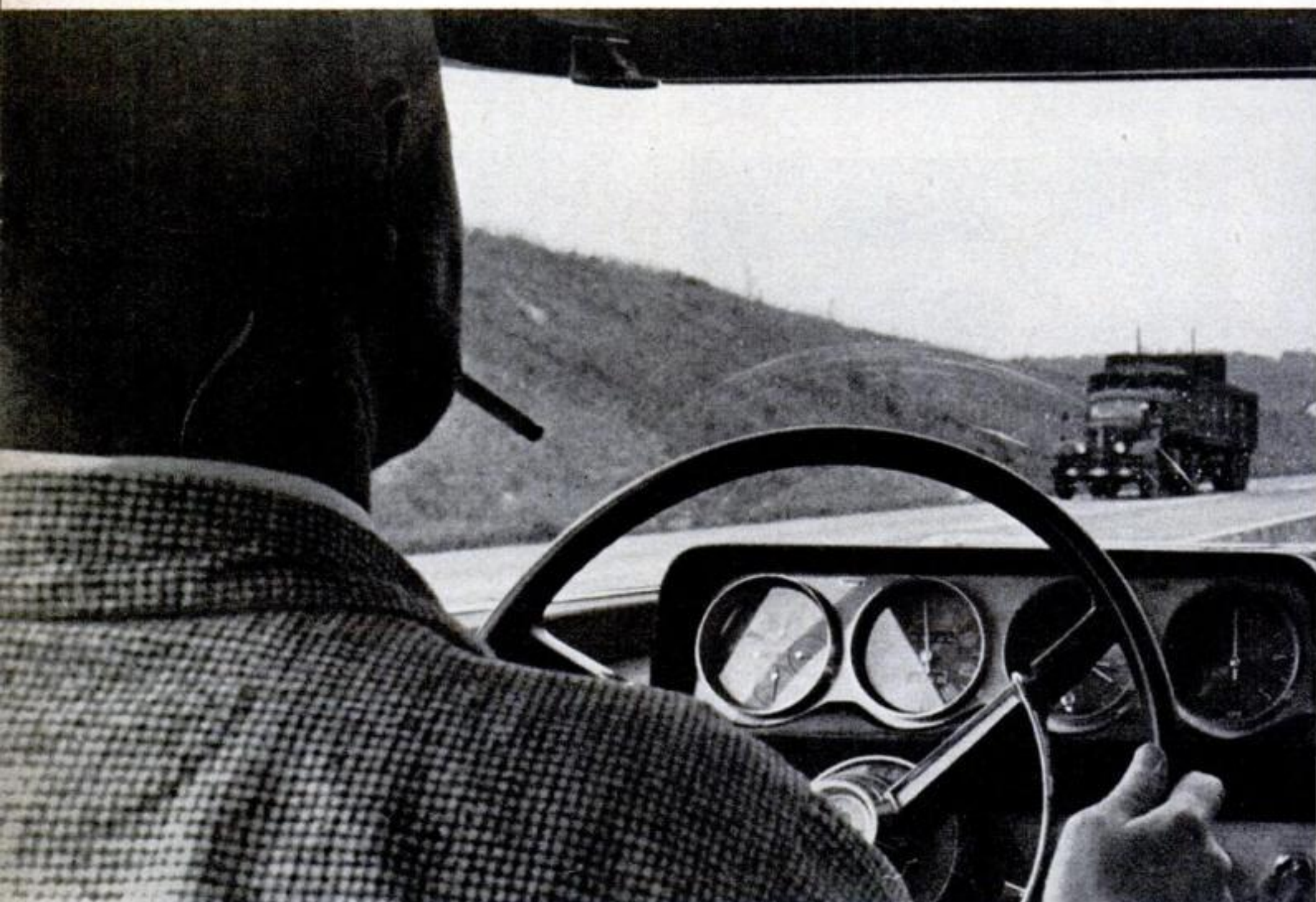
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We drove a Continental from

# Chicago to 17 hours,



"By now I was getting to know Mark II better. It was incredibly smooth, quiet and capable;

***Sticking to speed limits, Mark II matches "20th Century" time over America's longest stretch of superhighway.***

**By Henry B. Comstock**

PSM PHOTOS BY HUBERT LUCKETT

**W**E PICKED up our Mark II Continental on a scorching hot morning. It was purring politely at the curbside a few miles north of

"I drove the pikes. . . Lucky took the pix."



Chicago's Loop. Four air-conditioning ducts were whispering cool comfort down from the roof. The odometer showed 2,548 miles.

We—staff photographer Luckett and I—had been told to ferry the car from Chicago to New York. The assignment included making a complete running log of the trip: time, distance and speed figures; fuel consumption; point-to-point speeds—the works. We were to make the

100 POPULAR SCIENCE



# New York: \$27.08



you got the impression that you were gliding along just above the road, not touching it at all."

trip in two days (the second one a road-clogging holiday). We were under strict orders to obey every single speed-limit sign we saw.

"A man can now drive from Indiana to Manhattan on the longest superhighway in the world," the editor had told us. "No red lights, no intersections, one way all the way. We'd like to know what speeds a law-abiding driver can *average* in a good car on superb roads."

A couple of days and about 900 miles later we were able to tell him. We'd col-

lected a mass of figures that boiled down to this:

- With planning and expert hard driving, you can maintain an average speed on a superhighway that is not far from the theoretical legal maximum;

- On an ordinary, heavily traveled state highway, such an average is impossible without speeding and taking chances.

Both Lockett and I were tickled with the assignment. It was the first time I had ever had my hands on \$10,000 worth of automobile. From the driver's seat that





"We were to make this trip in two days—obeying every single speed-limit sign we saw."

hot morning in Chicago, the hood looked like the flight deck of the carrier *Forrestal*. I took a firm grip on the steering wheel. It was not much larger than one of those plastic jobs you suction-cup to

I'd wanted to make the Chicago-New York run within a single day, but the necessity of complete picture coverage seemed to rule this out.

**Check rein.** We agreed to hold a tight rein on Mark II's eager horses west of the Ohio line, as practice for the next day's chores. My part of this job proved easy. Between Whiting and Hammond, Ind., I bogged down in one traffic snarl after another. When we finally pulled up for lunch, I had averaged 25.5 m.p.h. for the first 49 miles.

Thirty-five minutes later, Lockett looked at me over a stack of empty dishes and said: "You must be dog-tired." I grinned back and tossed over the keys. He wheeled Mark II back onto U. S. Route 6 just in time to study the tailgate of a 20-ton truck for the next two miles. For the next hour, according to the log, we overtook a big freight hauler on the average of once every four minutes.

**Puny speed.** Lockett kept plugging away. Where he could, he eased Mark II up to Indiana's 65-mile limit. He drifted through villages and towns at the placarded 20 m.p.h. When we hit the approach pad to the Ohio Pike in mid-afternoon, our overall average for 187



"'Looks like rain,' the gatekeeper said."

the dash so Junior can help out with the Sunday driving.

**No brawn needed.** I toed the accelerator gently. There was no sound, but North Clark Street slipped eerily away past us. Three stop lights later, I was beginning to learn that you don't drive a Continental by ear, brawn and force of will. You simply show it a road map, settle back, and let it take you there with the quiet detachment of a drawing room on the "20th Century Limited."

Lolling along the cow paths south of Chicago, Lockett and I laid our plans for the turnpike run we would try the next day. With the opening of the new Delaware Bridge link, it was now possible to drive 674 continuous toll-road miles. We'd try to cover those toll roads between dawn and dusk of a single day, keeping strictly within speed limits and observing every good rule of the road.



"This Caddy bore down on us like a Nike."

flatland miles was a puny 35.5 m.p.h. It didn't look good for the next day.

To check the accuracy of the speedometer against the mile posts, we made a dry run of 30 miles along the pike. Our



stop watch suggested that the speedometer was very close, but just a whisker high: To clock a true 65, we seemingly needed to hold the needle between 66 and 67.

**Eating on the run.** Next morning we were out of our Angola, Ind., motel at 4:48 Central Daylight time. Mark II had lapped up 18.6 gallons of gas the night before. We figured that that would hold her for at least four hours. There was only one hitch: We couldn't find any place open to eat. That meant we'd have to make a breakfast stop on the Ohio Pike, which wouldn't help the log any.

We parked just outside the Ohio turnpike's West Gate and waited until a tired sun crawled over the horizon at 5:08.

"Looks like we'll have rain today," the



"21.3 gallons disappeared into the cavity."

tollgate keeper told us cheerfully. I grabbed my ticket and dug out fast.

Bacon and eggs set us back 22 minutes at a service plaza 20 miles down the road. When we took off again it was 5:51.

I tried as well as I could to hold the speedometer needle at an exact 67. But after we racked up some mileage it became evident that we had unfairly mistrusted Mark II's speedometer: If you kept it at 67 miles per for an hour, you'd cover 67 miles. So I backed off a hair and held it at an indicated 65 all the way across Ohio.

**The Ohio log.** We slowed for the East Gate toll booth at 10:10 Eastern Daylight Saving time. Luckett did some rapid pencil pushing. We had covered the 239 miles from gate to gate (and crossed a



"Tunnels pulled our average even lower."

time zone) in 4 hours and 2 minutes. That gave us an average speed of 59.2 miles an hour, which checked out with the breakfast stop. It also underlined the fact that if you drive steadily at the legal limit, and don't dawdle at the stops, your average won't be anything to be ashamed of.

I had used my brakes only once for traffic across Ohio. When you're holding the legal limit on this pike you are moving along very nearly with the herd. We overhauled 51 private cars—less than one for each  $4\frac{1}{2}$  miles—and practically all of these were going just four or five miles an hour slower. We figured that they were holding an *indicated* 65 and that the difference was just that their speedometers read high.

On the same 239 miles, 10 speeders passed Mark II. An eleventh one almost made it. I saw this Cadillac bearing down on us like a Nike, just in time to signal Luckett. He grabbed a camera and pointed its big lens through the rear window. All he wanted was a documentary shot. But the boy with the gold keys panicked. There was a screech of rubber and a violent dipping of chrome as he tucked in behind us. Although I signaled him ahead a dozen times in the next few minutes, he plainly mistrusted us. The last we saw of him, he was pulling off the road at a service stop—probably for a cup of black coffee.

**Fueling up.** Mark II showed signs of hunger after we began racking up the





"Over the bridge—and lots of daylight left."

Pennsylvania miles. We eased into a service area at 11:01. The pump attendant looked for a hole in the bottom of the tank as 21.3 gallons disappeared into the cavity behind the left tail light.

"Bro—ther!" he observed. "I could run my heap for a week on that. What kind of mileage do you get?"

I checked the odometer and the log. Since the fuel stop the night before we had come 304 miles, all but 10 of them on the high-speed pikes. That was an even 14 miles per gallon—not bad for a 2½-ton car.

We blew 11 minutes at the stop but made it pay off with a couple of sandwiches as lunch postponers. Like the

man had predicted, it began to rain. Luckett seemed pleased. All morning he had been trying to shoot scenics through a windshield that looked like the granddaddy of all insect cemeteries. (We had used up the contents of our windshield washer early.) Maybe it was the angle of the glass, or not enough updraft. Anyway, the mountain showers that came down for hours did a thorough job of window cleaning.

**Ashes in the ear.** By now I was getting to know Mark II much better. It was incredibly smooth, quiet and capable; you got the impression that you were gliding along just above the road, not touching it at all. We found one almost silly flaw. A left air duct was located so that as you brought a cigarette toward the ash tray in the door, the incoming air neatly stripped the ashes off, depositing a few of them in your left ear.

Although we were getting hungry, we figured that a late lunch stop was desirable—the farther east we got before stopping to eat and top up the tank, the more certain we'd be of making Manhattan without an additional gas stop. At 2:28, as we pulled off just beyond the Harrisburg East exit, a station wagon wheeled in beside us. The driver jumped out and opened our right door.

[Continued on page 228]

## How to Drive the Super-Roads

### FOR SAFETY

1. Be sure of your tires, brakes, fan belt and bearings—check, to make certain they're in good shape. Watch fuel and oil closely.
2. When entering a pike, feel your car out before you push it all the way up to the speed limit. When leaving, follow the exit speed signs and your speedometer—not instinct.
3. Keep a good air cushion between your car and the one ahead. Never get close at speed. Drive with your eyes far enough ahead to anticipate chain-reaction stops.
4. Maintain a constant mirror-check. Before changing lanes, be sure there's nothing hidden by a mirror blind spot.
5. Avoid "turnpike hypnosis" by stopping at the first sign of fatigue for rest, coffee, or a driver change. Don't eat heavy meals.
6. Never stop on a paved surface.

### FOR GOOD SPEED

1. Do you have to push? Decide if there's any real reason—or if the time will just be wasted at the other end.
2. Check your speedometer against mile posts. You may be able to go a bit above the indicated limit.
3. Combine food and fuel stops, and, if possible, time them away from crowded meal hours. It takes four hours of 65-m.p.h. driving to put you back on a mile-a-minute average after a 20-minute stop.
4. Divide oil- and tire-check duties and windshield washing at each fuel stop.
5. Stay legal and conserve your energy; cop-hunting is difficult, tiring and frequently unsuccessful.
6. Let the wildmen by whenever they want. It's the steady safe speed that eats up the miles, not the crazy bursts.





# *In 1959—* **New York to Chicago in 71 Minutes**

***What will it be like to fly  
600 m.p.h. in the first  
U. S. jet liners—now being  
test-flown? Here's a preview.***

**By Herbert O. Johansen**

**A**S I fastened my seat belt the stewardess handed me a booklet entitled "The ABCs of Jet Flight." She looked like a model, and certainly the cabin interior was as colorful and luxurious as an exclusive fashion salon.

"If you should want anything," she said, smiling sweetly, "there's a stewardess call button in the service unit up there." She pointed to a small ivory-colored



**TRIM HOSTESS** smilingly welcomes PSM's reporter aboard the jet liner in New York. "I think you will find a vacant window seat up forward," she says, checking my name off the list.

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**SPACIOUSNESS** is your first impression on entering the cabin through the forward passenger door (there's a door at the rear, too). Then the

color scheme catches your eye—light and bright—yellows, blues and pinks. This version of the jet airliner seats 98 first-class passengers.

box suspended below the overhead hat rack running the length of the cabin. In a window in the box a "No Smoking—Fasten Seat Belt" sign was lit. There were similar units over each row of seats. On the bottom panel of each unit were some gadgets. She showed me how to work the reading light and the air outlets for each passenger.

"Inside are emergency oxygen-system outlets and an individual loudspeaker," she added. "When the flight captain talks to the passengers you'd think he was sitting right in the next seat."

"Oh, High-Fi," I quipped.

"Yes, sir. And I can talk to you, too, from my station up forward. I will, later, when we reach altitude." She winked and walked noiselessly down the aisle's thick gray carpet.

A low crackling came from the overhead loudspeaker. Then a man's voice: "Welcome aboard Boeing's 707 Jet Stratoliner Flight One—an unusual one, which I hope you will all enjoy. Jet flying time between New York and Chicago is one hour, 11 minutes. Thank you."

While waiting for the cabin to fill, I

pressed a button on the right armrest. The back of my seat pivoted backward into an easy reclining position while the seat itself slid forward. I had noticed pretty little pink head pillows strewn along the hat racks, and there was a loose footrest on the floor that I could kick around to suit my leg length. Comfort. But that I had expected in an airliner that will cost \$4,500,000 in the domestic version (New York-Los Angeles: four hours, 12 minutes) and a million more for a bigger intercontinental model that will fly the Atlantic nonstop in either direction (New York-Paris: six hours, 10 minutes).

A humming distracted me from my musings. It wasn't harsh or shrill. I thought it was induction noise in the loudspeaker until it spoke up:

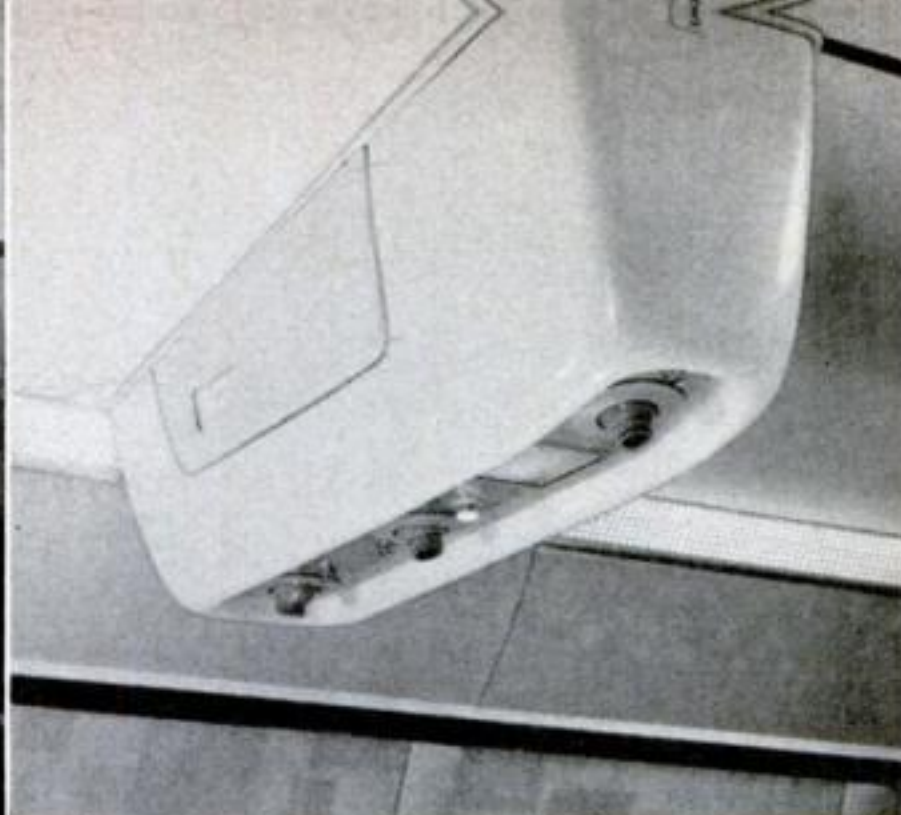
"You are hearing the sound of four jet engines that will give the 707 a cruising speed of between 550 and 600 miles an hour. They cause no cabin vibration in flight. There may be a slight noise surge when reverse thrust is cut in on landing to shorten the ground run."

The noise level was quite low. Later,





**THREE-ABREAST SEATING** on one side, two on the other, will be the most common arrangement. Armrests fold back so that the full width of a seat row can be used if desired.



**PASSENGER SERVICE UNITS** are suspended from the hat rack above each row of seats. They have a stewardess call button, individual air inlets, directional reading lights.



**HAT RACK** is placed high so that a passenger does not have to choose between stooping or bumping his head in getting in or out of a window seat. This is a two-abreast row.



**INDIVIDUAL FOOTRESTS** are a convenience in adjusting oneself from a sitting-up to a reclining-seat position. Tracks in the floor make for quick changes in seat-row spacing.



**LOUNGES**, one forward and one aft, accommodate five in convivial comfort. Each can be converted to take two rows of regular seats, increasing cabin capacity to 108 passengers.



**BALANCING PROBLEM IS GONE** in lap eating. Tray supports slip into slots in the armrests. The window has a smoke-tinted shade that pulls up. A similar opaque one pulls down.





**LAVATORIES**—there are four—will attempt to duplicate the effect of a small powder room in a private home. Hot and cold running water, of course. In adding speed, jet airliners will sacrifice nothing in the way of comfort. The coat closets are another homelike feature.

when I got to talking to my seat companion, I wasn't even aware of it.

The "Fasten Seat Belt" sign went off. I got up to take a look around. Because the hat rack was almost six feet above the floor I didn't have to stoop, and the 40-inch spacing between seat rows made it unnecessary to stumble over the legs of the man next to me in the aisle seat.

At the rear of the cabin four people were sitting in a handsome lounge enjoying cool drinks. There were two lavatories and a galley there. This is duplicated up forward, I found as I continued my tour to the other end of the cabin. The galleys can serve either prepared tray meals for transcontinental flights or heat precooked and refrigerated meals on over-ocean runs.

As I sat down in an empty aisle seat, I found that I didn't need to crane my neck and lean across the fellow next to me to see out. There are twice as many

windows as in a conventional plane, affording every passenger a good view.

The loudspeaker spoke up again. It was my stewardess. "Watch the dome lights above the aisle, please."

*Slowly the lights dimmed*, as we looked up, then turned to a sunset-red glow, and from that to blue. Suddenly stars appeared in the domes. It was like looking right up into the night sky.

"That blue-with-stars can be left on for night lighting," the stewardess explained. "Then, as dawn comes, it would change to a sunrise glow . . . And now, if you'll look up at your service units you will see that it's time to fasten seat belts again."

We didn't fasten our seat belts, of course. We had never left the ground. Our "flight" had been made in a full-scale, 95-foot-long cabin mock-up located in a New York City loft building. The jet-engine noise had been a recording. But the real Boeing 707 Stratoliner, scheduled to go into commercial jet airline service late in 1959, will be able to make New York to Chicago in one hour and 11 minutes' flying time.



**END OF A "FLIGHT"** that never left the eighth floor of a New York City loft building. This is an outside view of the half-million-dollar, full-scale mock-up of the Boeing 707 Stratoliner in which the author made his simulated jet luxury flight from New York to Chicago. **END**





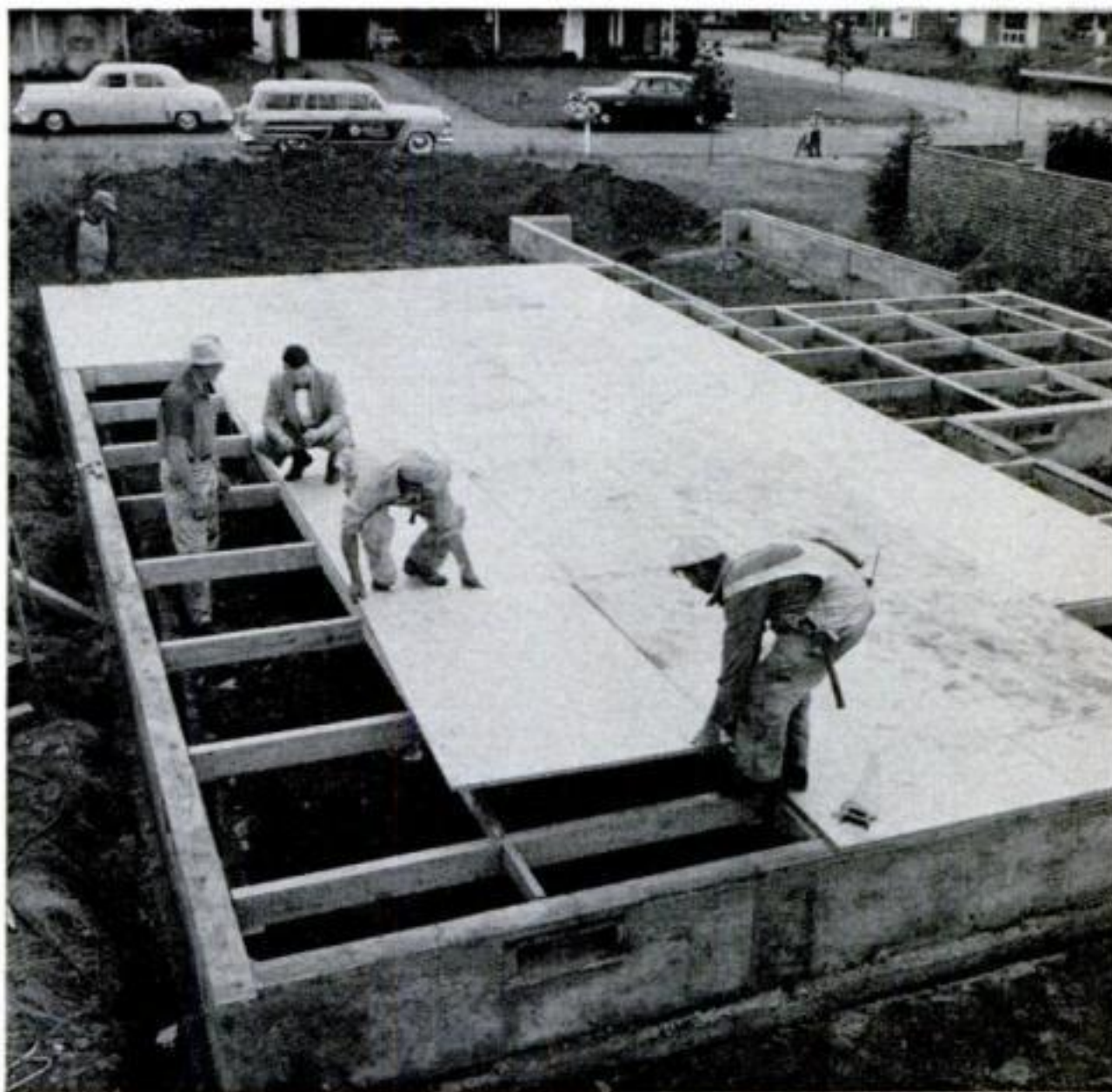
## How to Waterproof a Lake

AN EXPERIMENTAL liner for irrigation ponds that stops seepage may prove a new weapon against drought. Above, farm experts at Clemson College, Clemson, S.C., lay down a plastic tarpaulin on the floor of a pond (shown filled at right). Since soil permeability is no problem, ponds could be located anywhere.




## Single Plywood Panel Does Two Flooring Jobs

LAY a subfloor with a new plywood panel called 2.4.1 and you put down an underlayment, too. Nailed to girders spaced four feet apart, the 1½-inch panel provides a solid base for wall-to-wall carpet, linoleum, tile or hardwood. It more than halves the number of pieces needed for floor framing, piling up savings ranging from six cents a square foot to \$500 a house, a survey by the Douglas Fir Plywood Assn. reveals.






# How to Keep from




**FIRST STEP** in rigging the rope is to hammer an eyed spike, called a piton, into a crack in the rock. Proof of tightness is a musical ring from the final hammer blows. If there is no music, better try another rock.




**CARABINER** is snapped into the piton's eye. It's a metal snap link to hold the rope and act as a pulley for "belaying" a climber from one safety spot to another. The closer the pitons are, the shorter the fall in case of accident.



**SAFETY LINE** is pushed through the carabiner by the leading man. The second man, in safety position, pays out rope. Experts take great care not to allow their rope to become damaged. An undiscovered cut might cost a man's life.



**LEADING MAN** starts to climb higher, above piton, searching for a new safety position to which he can belay the other climbers. If he can't find one within about 15 feet, he drives another piton before going on up the mountain.



**ABOVE PITON**, the leader's danger increases. If he slips, he'll fall twice the length of rope from piton to his body before the second man can snub him to a stop by applying friction on the safety line through the carabiner.

**F**OR the expert mountaineer, the true goal of mountain climbing is to climb safely in dangerous places.

He knows that his return may depend on a little thing. He checks clothing, footwear, food, flashlight, ice ax, ropes, pitons, carabiners, crampons.

He studies the route and files a climbing plan. Even after starting, he turns back if conditions of rock or snow or weather become unexpectedly perilous, or if sections of the climb prove beyond the ability of any one member of his party.

On the mountain, he follows the planned route. He is not enticed by the delusion of short cuts. He will not climb down by a route he has not previously climbed up.

In the tough spots, he and his teammates use the rope as shown in the pictures on these two pages.—*Orrin H. Bonney.*



**ROPE IS PAYED OUT** from safety position at left by the author, Orrin H. Bonney, to lead man, Dick Pownall, who drives a piton. Both are guides in the Grand Tetons in Wyoming.

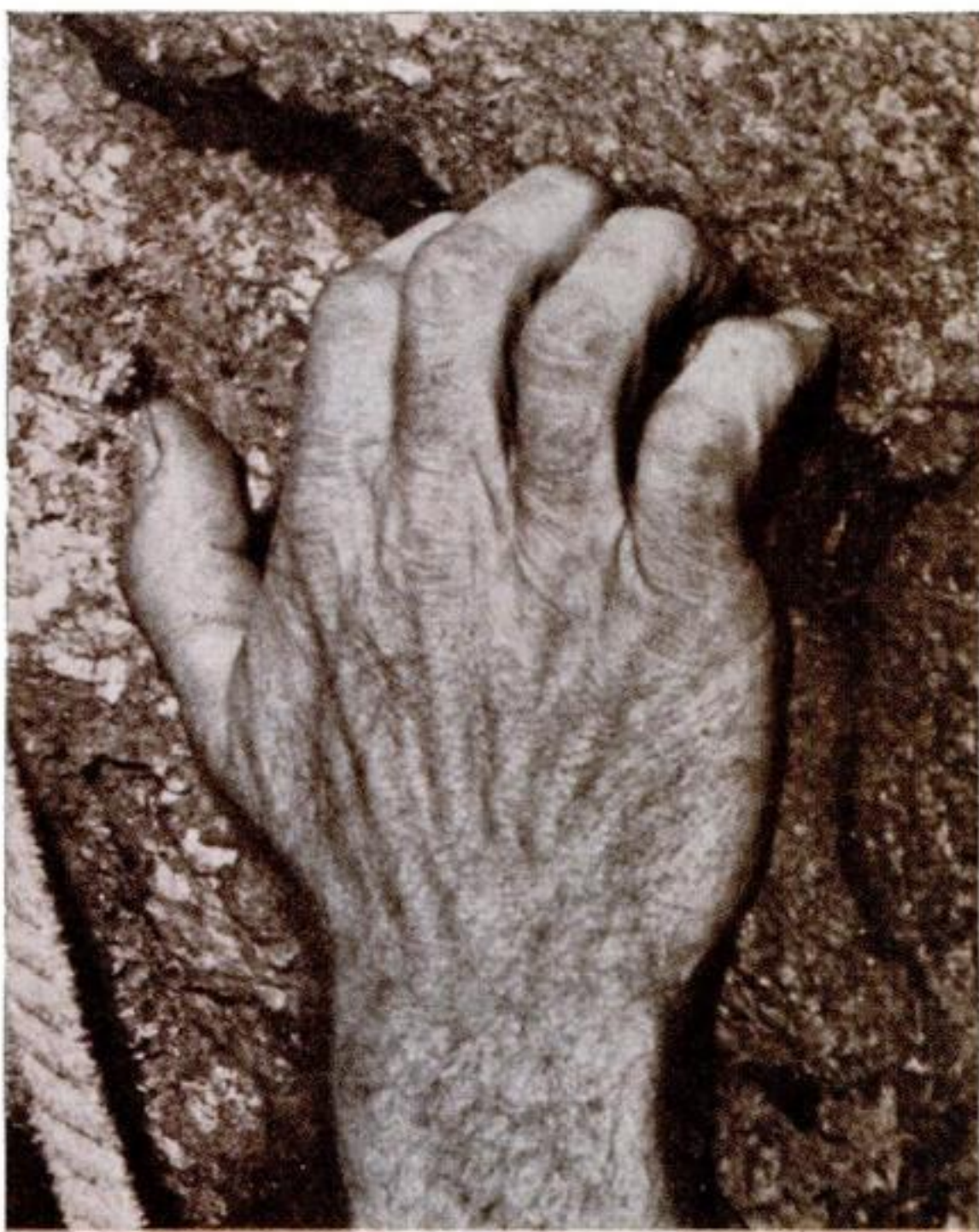


# Falling off a Mountain

**MOUNTAINEER** climbs the mountain—not the rope. Any crack (right) may be a hand hold or a step for his feet. The rope is strictly a safety line to be used in case someone falls or slips.



**CLEATED BOOTS** with soft, flexible uppers are best for climbing on rock. Against steep ice, spiked crampons should be strapped to the soles. Sneakers may be good on dry rocks but are dangerous to wear on ice or slimy surfaces.



**CLIMBING PAST PITON**, the lead man finds the going precarious. The second man feeds out rope by letting it slip through his hands with just enough drag to keep it from hanging slack between them. Suddenly the climber slips . . .



**SAFETY MAN SNUBS FALL** by increasing the drag on the rope, quickly but gradually, by tightening the loop around his hips and bracing himself against the rock wall. Saved, the lead man can scramble back up for another try.



# Why a Wife Says "No"



*Science now explains a common maladjustment that sends many good marriages to divorce court.*

**By John Kord Lagemann**

**N**OBODY could say that Tom wasn't considerate. After Margie complained of being tied down to the house, Tom took her out on the town—dinner, a musical, and then dancing at the little place they used to go.

Back home, Tom anticipated the end of a perfect evening. But, as they closed the door, Margie turned her back and said, "No, Tom—not tonight."

The eruption of temper this set off almost wrecked their marriage.

"How can she do this?" Tom asked the marriage counselor they went to.

"Why can't he understand when I'm not in the mood?" asked Margie.

These questions are behind many of the maladjustments that send husbands and wives to the divorce courts. In some degree they crop up in even the happiest marriages.

"*It's all in your head,*" a wife sometimes tells her husband. This is truer than she may realize. Scientists have evidence that the brain plays a tremendous part in the male sex drive. But it has very little direct connection with female sex behavior.

The specific part of the brain involved in males is the cerebral cortex. When this is removed from female animals, they go right on with their periodic mating as if nothing had happened. But

*Condensed from Bluebook, May, 1956.  
Copyright, 1956, by McCall Corp.*





*Before taking a case to court, an attorney  
tries to see if the marriage can be saved.*

.....

removal of the cerebral cortex from male animals completely destroys their sexual interest and capacity. The implications of this are, as Yale anthropologist Dr. Cleland Ford points out, "of the utmost theoretical importance."

For a husband the implications are highly practical. It means that he is aroused by mental or psychological factors that leave his wife cold. This goes a long way toward explaining why husbands are baffled when their wives fail to share their ardor.

Unlike his wife, a man is aroused by

the mere idea of sex. Anticipation puts him in the mood. He may think warmly about his wife during the day. Then when the long-anticipated moment has arrived, it is difficult for him to realize that it isn't frigidity that makes his wife say, "Oh, no, please—not tonight." The fact is that up till that moment the thought of sex probably hadn't entered her head.

*A sniff of perfume* can set off a train of associations in a man's mind. He has no such simple device for engaging his wife's interest. Women don't make such

.....

#### A NOTED CLERGYMAN COMMENTS ON THIS ARTICLE

*"This is a frank and wise treatment of a problem in marriage which pastors know to be a persistent one. The article, I am sure,*

*will help many couples in our land toward better fulfillment in what is one of the crucial aspects of their total relationship."*

—THE VERY REVEREND JAMES A. PIKE, Dean  
Cathedral of St. John the Divine, New York

AUGUST 1956 113





*Even at work, a pretty girl is not likely to go unnoticed.*

.....

far-fetched associations. Every male has a wide array of such push-button associations that are almost completely absent in a woman's thinking.

Kinsey asked over 12,000 men and women how they responded to a variety of psychological signals such as burlesque, erotic stories, drawings and photographs. The great majority of men said such things aroused them. A few women were as strongly aroused as men. But the great majority of women were unmoved by mere representations or suggestions.

**The difference in response** to nudity is the source of many a wifely "no." Even after being married a long while, an affectionate husband may be aroused by watching his wife undress, or even by imagining her in the nude. But the sight of him getting undressed or taking a

shower is more likely to arouse his wife's sense of humor.

The average man's waking hours are laced with reveries that are often accompanied by a degree of physical arousal. This is so commonplace that he may scarcely notice it. Few women have erotic daydreams, and fewer still are physically stirred by them. Unlike his wife, a man is easily distracted; even in the midst of concentrated work, a pretty girl anywhere in his vicinity is not likely to go unnoticed.

Women are pleased by the sight of a handsome male, but not in the same way. When they wonder "what he's like," they're interested in his personality, his social and economic status, and in the impression they have made on him.

**Because sex is never far** from their thoughts, men are likely to become amorous on short notice. Women aren't. A husband returns from work and, finding his wife busy in the kitchen, pats her tenderly and proposes what he thinks is a great idea.

"Go away," says his wife. "I'm too busy now. Scram." She still has to vacuum the living room and peel potatoes and put on the roast. "That's how much she cares about me," her husband thinks. "A few lousy potatoes are more important to her."

**Routine is important** to a great many women, and it is next to impossible for them to drop what they are doing to indulge in dalliance.

For a man, being in love with his wife consists first and foremost in his satisfaction with her as a sexual partner. For a woman, being in love with her husband consists of preferring him as a life companion, the father of her children, the breadwinner, the determiner of her security and status. His performance as a lover is important, but is not the indispensable requirement.

Sooner or later the majority of healthy males discover that sex just isn't as urgent or interesting to their wives as it is to them. There is evidence of this in the contrasting motives that lead men and women to infidelity. "The other woman" is almost always a more satisfying sexual



partner. "The other man" is usually a more interesting companion.

**The basic differences** that make wives say no when their husbands say let's, boil down to this: Men are aroused by thoughts and symbols, while their wives are aroused almost exclusively by sex itself. With stimulation, most physiologists agree, she is just as capable as a man of experiencing full sexual pleasure. But for this she has to be aroused emotionally as well as physically. "Mood stimulation," psychiatrist Dr. Lena Levine calls it. It consists primarily of banishing a woman's fears and doubts about herself. Most experts agree that this is the most important single element in a man's love-making. The reason: No woman can feel loving unless she feels lovable.

"I'm just a housewife," said with bitterness, is probably the commonest expression of a state of mind that makes wives reject sex relations. It's actually another way of saying, "I'm a flop as a woman." When she says, "I'm no good at sex," what she really means is, "I'm no good."

There is a highly useful rule of behavior that applies to every form of human activity. This is the rule that people like to do anything they do well and avoid like the plague activities that diminish their good opinion of themselves.

**If a wife's sexual ventures** repeatedly end in failure, she will go out of her way to fend off her husband's advances. If she has an occasional success she will keep on trying. In anger at being rejected, husbands sometimes accuse their wives of being cold toward them. Obviously this sort of outburst only makes things more difficult.

After quarreling, a husband is likely to think of sex as a way of making up. But unless his wife has completely forgiven him, she is likely to say no. For a man, sex can be both personal and impersonal. As in a tennis match, he doesn't have to admire the person across the net to have an exciting game. His wife does. To enter wholeheartedly, she has to like and want to please not only herself but her husband. Physical stimulation is im-



*A man in a shower is apt to arouse a wife's sense of humor.*

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portant, too, but only after she is in the right mood.

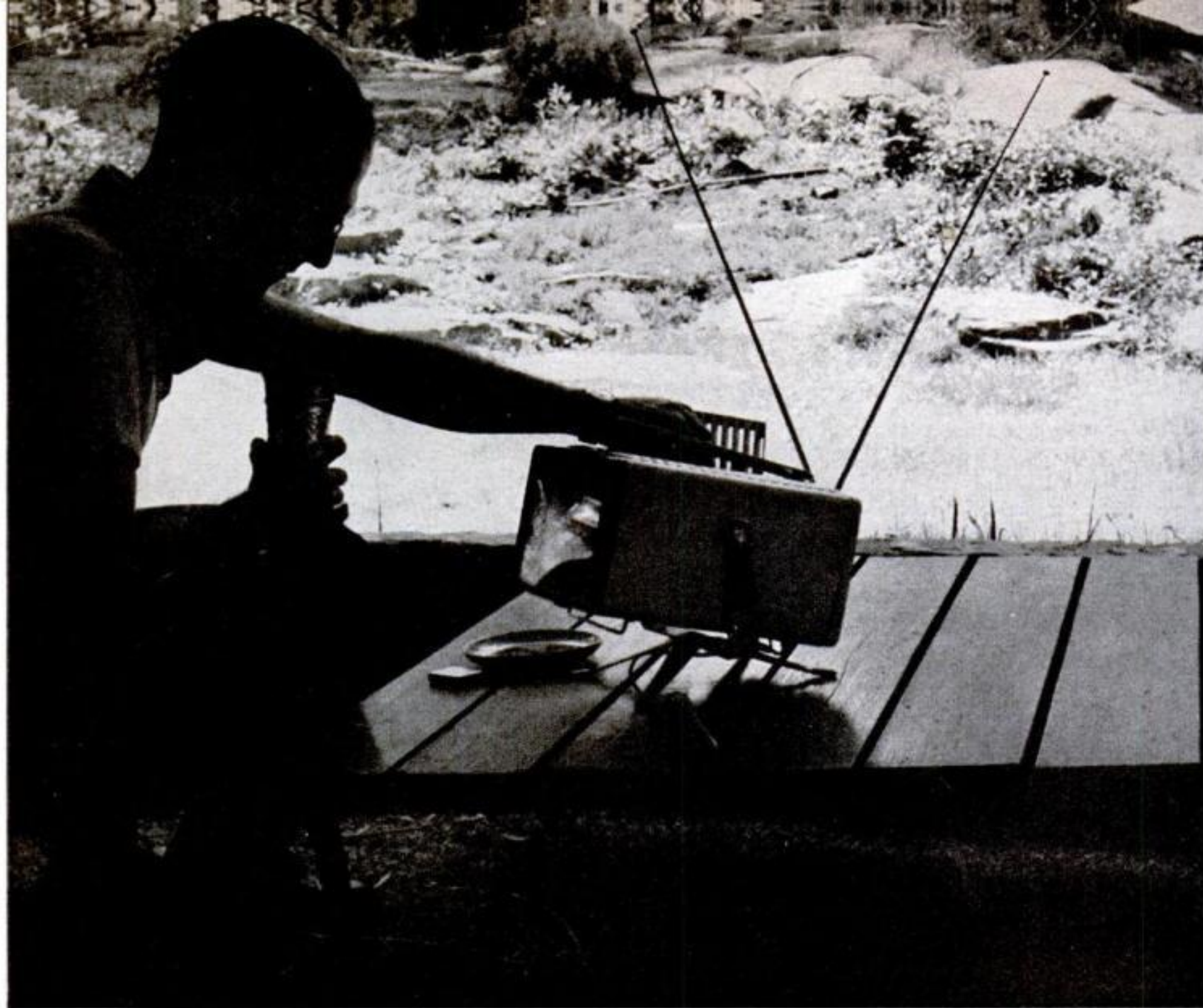
Marriage relationships are always more satisfying when husband and wife share desire and fulfillment. The acknowledgment that wives are also entitled to enjoyment has placed a responsibility on husbands that their grandfathers didn't have. One result is to make conscientious husbands feel that it's their fault each time their wives fail to reach fulfillment.

But it may be the wrong time of the month. There is no doubt that the hormones that produce menstruation also profoundly affect a woman's emotions. Husbands who watch the calendar for a few months may be able to tell in advance when their wives are most likely to say yes.

**Fear of an ill-timed pregnancy** causes

[Continued on page 242]





Baseball in comfort: New portables let you enjoy TV in the cool shade of an outdoor porch.

# How Good Are the

**By Hubert Lockett  
and Martin Mann**

**S**MALL-SCREEN television is back. You almost expect to see the lady wrestlers again. But these receivers are a new breed of TV sets: portables. You can carry them around and play them wherever there is 110-volt AC. You can even pack one for a picnic if you have a converter that will run it off the car battery.

*How portable is portable?* Apparently it's the handle on the cabinet that makes a TV portable—and not every model even has that. Practically all manu-

facturers are offering these sets. Screen sizes vary widely—8½, 9, 10, 14, even 17 inches. Cabinet dimensions grow to suit. One tiny 8½-inch set is 10 by 9 by 13 inches, including its special stand. A typical 14-incher, without stand, is 11 by 13 by 18.

All are light in weight—but none is likely to be trotted upstairs by a five-year-old. One nine-incher scales a bare 13 pounds, but an 8½-incher tips 22 pounds. A 14-incher may be as light as 26 pounds. Some models are available in either an aluminum or a steel cabinet. Better heft the set you're interested in.

While none of these TVs has to be tied to a house-top antenna, neither are



**Portable? Well, sort of. Fun? Yes!  
Here's a first-hand report on what you  
can expect from today's small sets.**



Small screens show their stuff. From left: GE 14-incher, Admiral 10-incher, RCA 8½-incher.

## New TV Portables?

they truly portable the way that portable radios are. They are *not* battery-operated; they require a 110-volt AC power supply. They are heavier than radios. And outdoors, daylight pretty well washes out their pictures.

**How well do they play?** PSM tried out three TV portables: the RCA 8½-inch "Personal," the Admiral 10-incher and the GE 14-incher.

All performed remarkably well. No test of single samples is conclusive; but the similarities—and differences—in performance in different locations indicate what you can expect from any portable. Here's what we found:

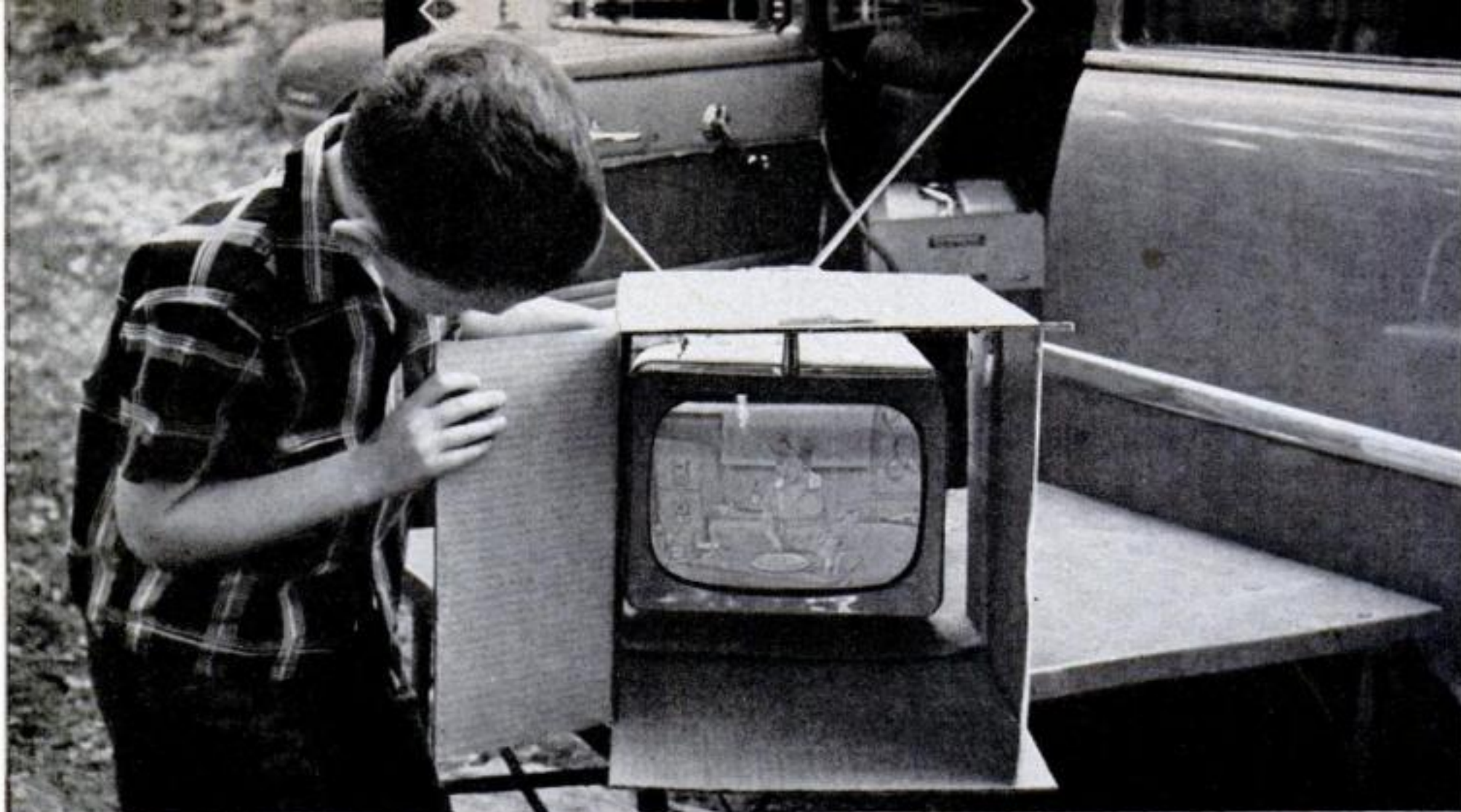
**Sensitivity.** We portaged our three

portables to exurban Westchester, 40 miles as the TV signal flies from New York City transmitters. All produced acceptable pictures, but the higher channels—7, 9, 11, 13—came in best. The GE had a little the better of it, especially on channels 2 and 4.

The preference for higher channels can be blamed on the rabbit-ear antennas, which, as a compromise in design, are about the right length for channel 7 when fully extended. They can be shortened for higher channels. To tune them to lower channels, you can clip wire to the arms. We tried this and it improved reception on channels 2 and 4.

We next tried the same receivers in





**PORTABLE IS REALLY PORTABLE** if you equip car with converter to change battery's DC to 110-volt AC. TV works fine, draws about as much

juice as headlights. In daylight you need a hood—a cardboard carton. Converter (rear) is a Powercon, from Lafayette Radio, New York.

an area of average signal strength, a suburban home about 15 air miles from the transmitters. Here all three produced good pictures on all channels. Except that the RCA needed a dark room for good visibility, they performed about as well as standard table models.

**Location**—in the same room—made a startling difference in the performance of the portables. Just moving a set from one table to another changed a marginal picture into a definitely acceptable one.

Placing a set near a window screen seemed to help, possibly because the metal screening re-radiated the signal to the antenna. We tried one set in a bedroom and noticed an objectionable ghost—which disappeared when we raised the aluminum Venetian blind nearby. In trying different locations, it is best to avoid hot places such as radiators—these little parts-packed receivers should be kept as cool as possible.

**Picture quality.** The GE and Admiral portables have aluminized picture tubes with filter-glass faces. Their images were sharp, and bright enough to watch on a shady porch or even outdoors in daylight if hooded in some way.

The RCA Personal has a special "Deep

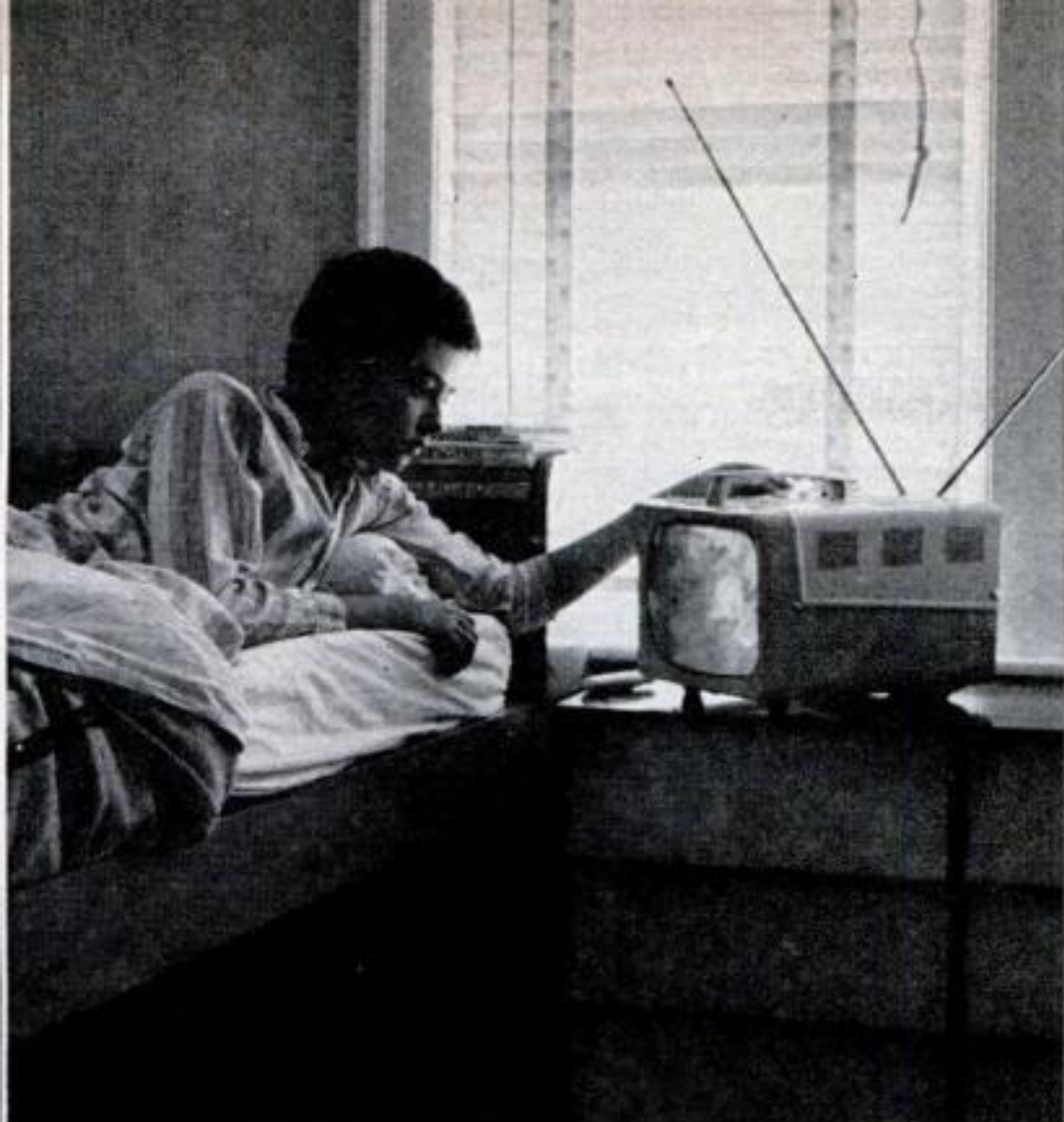
Image" picture tube that gives a soft gray, almost sepia image. This was not nearly so bright, but turned out to be exceptionally pleasant for prolonged, close-up viewing in a darkened room—and that is primarily what the tiny set was designed for.

While all three of these portables have circuits that are well endowed with filters and traps, we found them susceptible to random interference: airplane flutter, ignition and motor noise, even stray radiation from an electric-light bulb. They also picked up radiation from other receivers. This last is a point to consider if you are thinking of buying a portable for the children to use at the same time you watch adult shows on your big receiver. The big set may cause a herringbone pattern to appear on the screen of the portable.

**Circuitry.** These portables are so tightly packed with electronic gear that free air flow for cooling is essential. The cabinet vents should not be blocked.

The RCA uses only 11 tubes, the Admiral and GE 14 each. Yet, because some of these are multipurpose tubes, the number of tube functions performed in each set is the same: 19. The IF band-





**ENTERTAINING SICK CHILDREN** is one chore portable TVs are sure to take on. Even the larger models are easy to carry around the house.

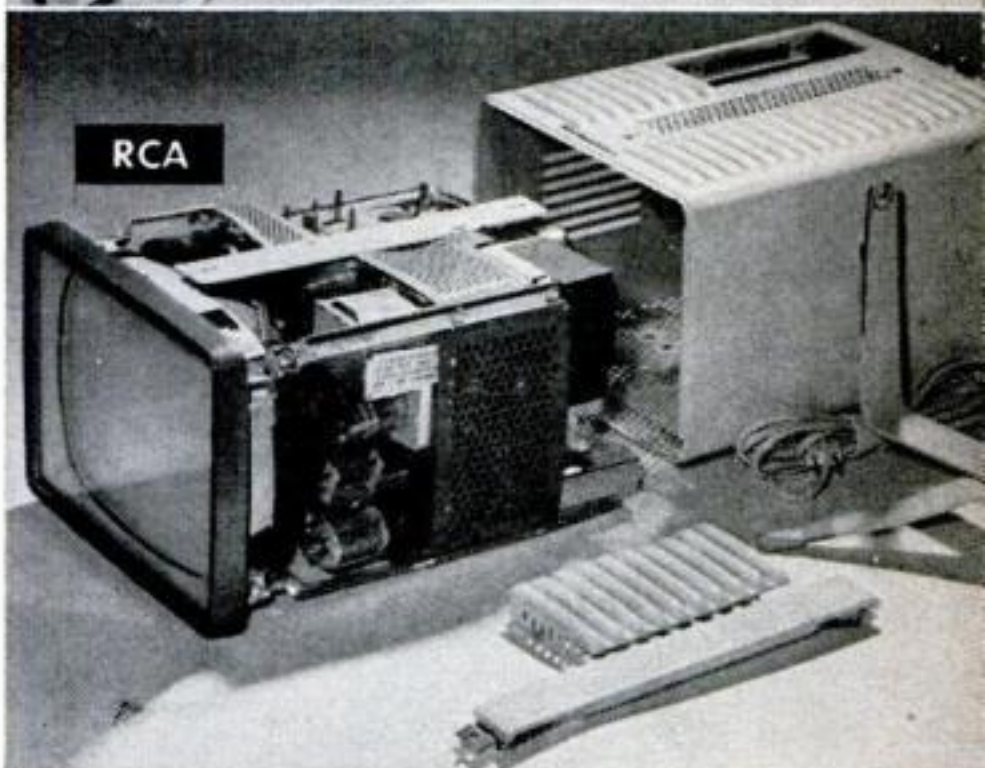
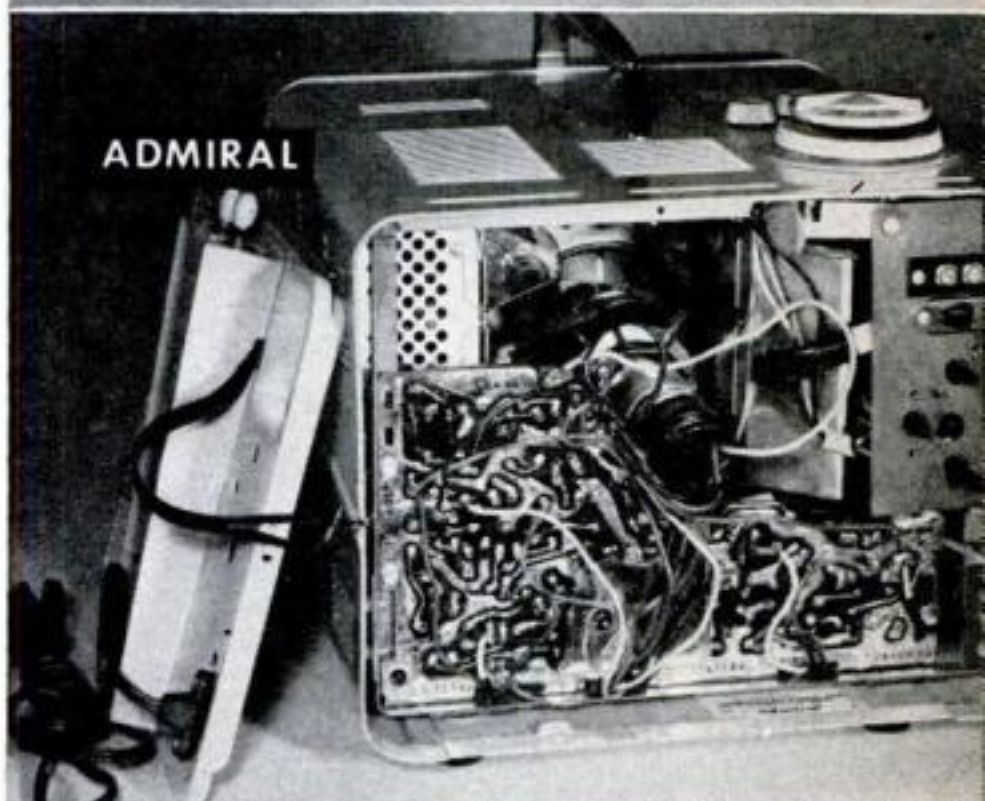
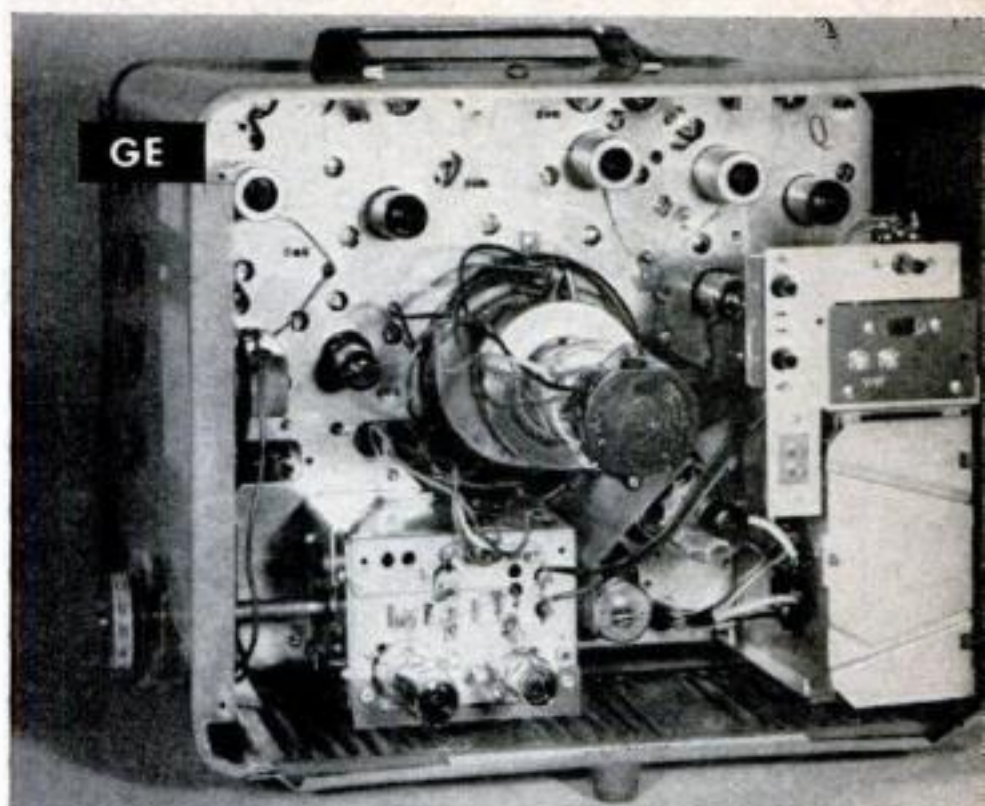
width in each is about two megacycles, which sacrifices some picture detail, but not enough to be noticeable on such small screens.

The GE and Admiral have series-wired tubes and electrically hot chassis. The RCA has a power transformer with parallel-wired tubes. However, you should be cautious about touching any of the cabinets or antennas when your body may be electrically grounded.

**Portables aren't so new**—one firm made a three-inch set in 1949. But the trend was to bigger and bigger screens until GE's 14-incher caught the public's fancy last fall. Now industry forecasters predict that 1,250,000 small portables—17 percent of the total TV output—will be sold this year. Last year such small receivers accounted for only 3.6 percent of production.

One reason for the small sets' popularity is smart looks. The RCA Personal, snappily slung in its cradle, is far and away the sexiest. But all of them are eye-catching, with auto-bright color schemes or lush plastic covers.

Low prices also help. Most portables cost \$100 to \$130—and the smallest are not necessarily the cheapest.



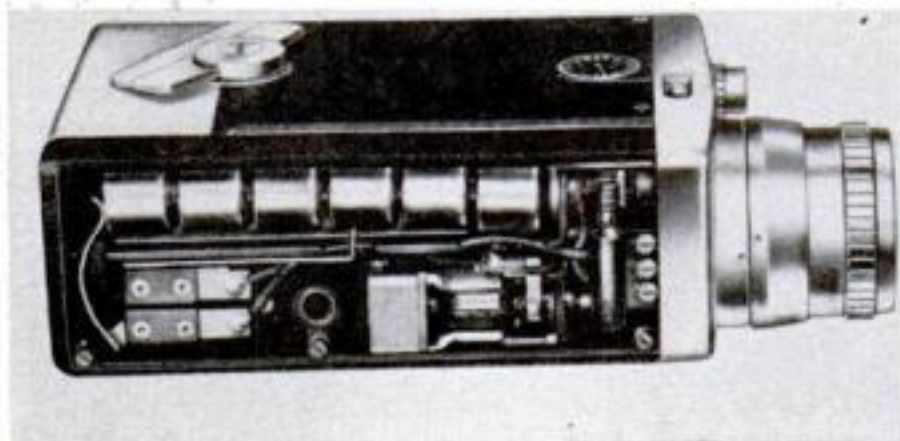
**THE SMALLER THEY GET** the harder they are to service. With the GE 14-incher (top) you can replace tubes by removing the cabinet back. With the smaller Admiral (center) you have to unbolt and tip a printed-circuit board to get at some tubes. With the tiny RCA (bottom) you must pull the chassis and, for some tubes, partially disassemble it. Both the GE and Admiral portables make extensive use of printed circuits. The Admiral is the lightest of these three receivers—tipping the scales at 16½ pounds. **END**





### Electric Eye Sets Camera Lens

THIS movie camera automatically adjusts its lens for varying light, even while the subject moves from light to shadow. The gimmick: a photoelectric cell below the lens. Six mercury-cell batteries (at top in the view below) supply current to operate the electric eye and the tiny motor (lower right) that moves the iris. The camera is made by Bell & Howell.



### Non-Tip Craft Skims Waves on Double Hull

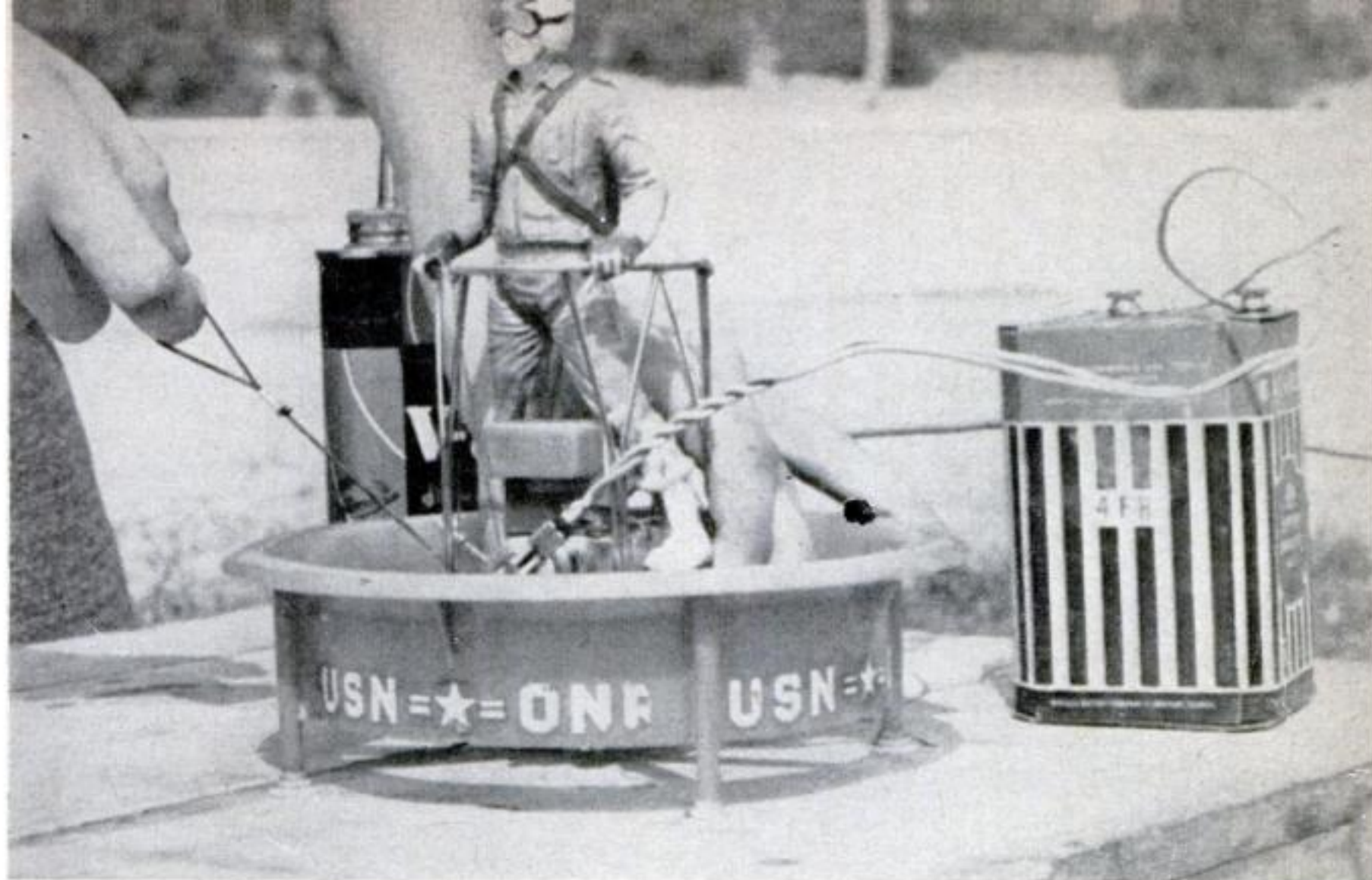
THIS puddle-skimming outboard planes over the surface on twin pontoons. Non-tipping, it has six watertight compartments. The maker, Pair-A-Dice, Inc., Alderwood Manor, Wash., says that the double hull rides high in rough water with almost no slap.



### School Bus Has Roll-Out Engine, Automatic Shift

THE engine on a new GMC school bus rolls out for repair and back in for work to make maintenance easier. The driver sits ahead of the wheels with no hood to block vision, and gets a bonus in a shorter turning radius. He never has to shift—the 160-horsepower engine is equipped with Hydra-Matic transmission.





**READY TO TAKE OFF**, this model Flying Platform is started by pulling an automatic-recoil

cable. The 1½-volt battery provides ignition for starting but is disconnected for running.

## Youngsters Fly Baby 'Pie Pans'

**A** JUNIOR version of the military "flying pie pan" (PSM, June '55, p. 94) is making regular flights before its parent gets out of the development labs.

From many a park and back yard will soon rise the snarl of realistic little powered plastic models of the Hiller Flying Platform. The toy, made by the Wen-Mac Corp. (11511 Tenn. Ave., Los Angeles) in cooperation with Hiller and the

Office of Naval Research, gets vertical lift by sucking air down through a ring wing, just like its dad. It is powered by a tiny internal-combustion engine that spins its prop up to 18,500 r.p.m. The model can hover, dart sideways and climb a column of air to a height of six feet or more. It stays aloft two minutes. Fuel is a thimbleful of ready-mixed methanol, nitro methane, castor oil and additives.



**CONTROLS ARE SIMPLE**, the gun-grip handle in this lad's right hand being attached to a semi-flexible wire connected with the flying model, the cord in his left operating the throttle.

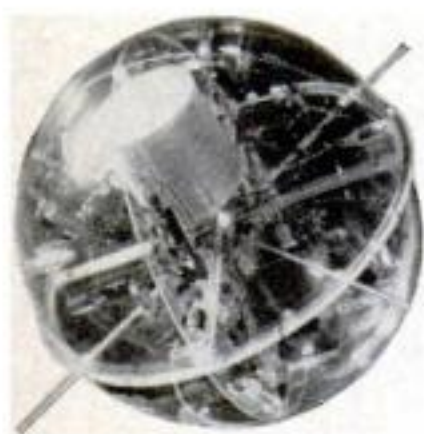


**RIISING VERTICALLY** in takeoff, the baby Flying Platform can be made to zoom off sideways as youngster tips the control handle to left or right; or go up or down by working throttle.



**Here are the answers to**

# 20 Common Questions

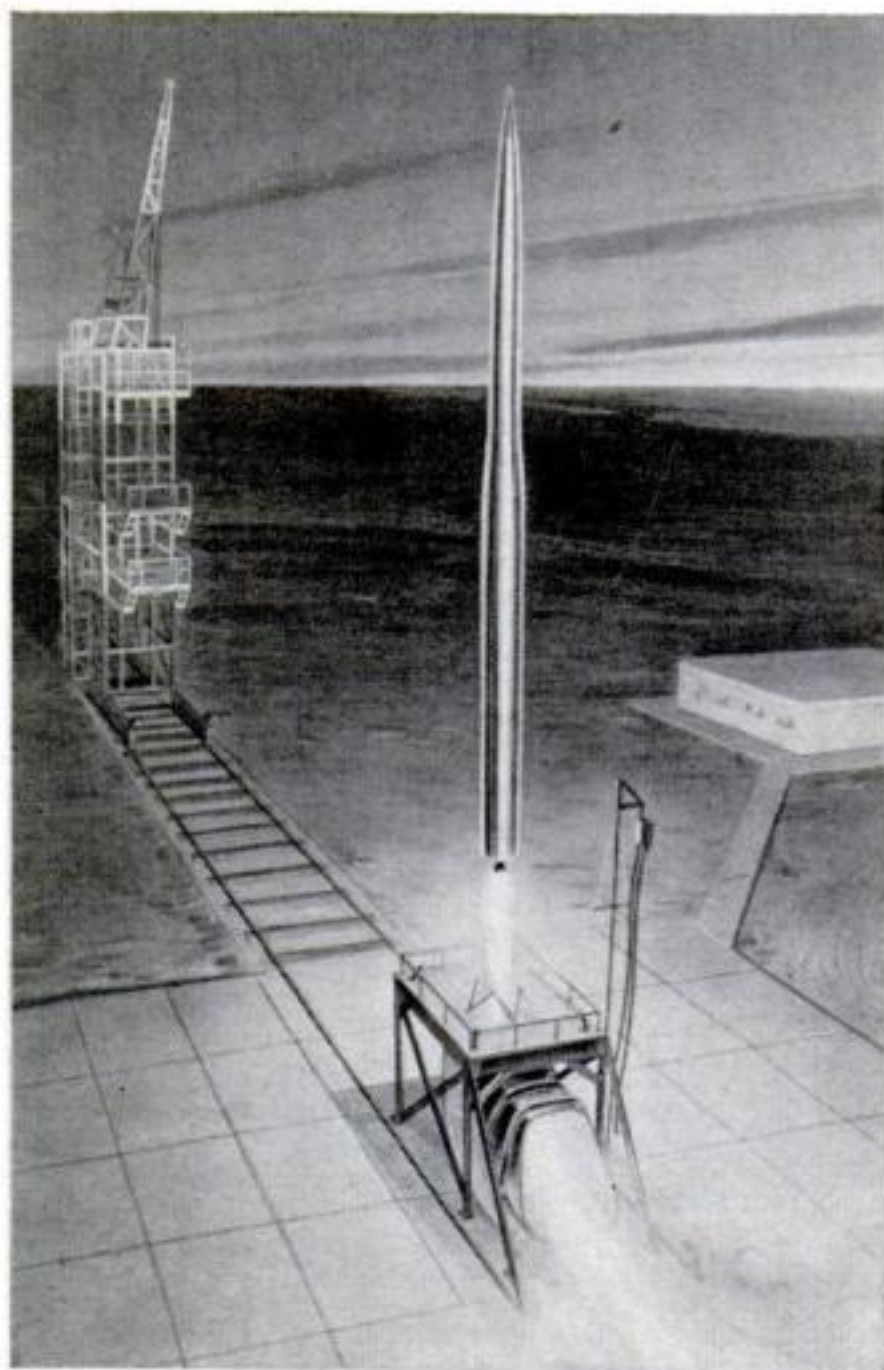


AS U. S. scientists work feverishly toward launching artificial earth satellites—minimoons—during the forthcoming International Geophysical Year, the public is

posing a growing avalanche of questions about the project.

Many of them are being asked by people who have seen POPULAR SCIENCE MONTHLY's model earth satellites, now on exhibition throughout the country.

Here are the questions and answers:



**FIRING OF A THREE-STAGE VANGUARD** rocket that will launch the earth satellites, as visualized by an artist. The drawing on the opposite page shows the probable flight path it will take.

**Q** *When will the launching of the artificial earth satellites start?*

**A** It's set for early in 1958.

**Q** *Where from?*

**A** Patrick Air Force Base on Cape Canaveral, on Florida's east coast.

**Q** *How big will the satellites be?*

**A** Small—probably about 20 inches in diameter.

**Q** *What will the shells be made of?*

**A** At least one probably will be plastic, because a nonmagnetic, non-conductive material is necessary for certain experiments. Aluminum is under consideration for the other satellites.

**Q** *How many will be launched?*

**A** Probably from 12 to 18 of them.

**Q** *Will they carry any kind of power?*

**A** Yes. Long-lived mercury batteries have been suggested.

**Q** *What information will the satellites collect?*

**A** Many kinds, among them the strength of the earth's magnetic field in space, the density of hydrogen gas in space, and the occurrence of solar X-rays and ultraviolet rays.

**Q** *How will they get it? How will it be transmitted?*

**A** Let's take one type of information—electrical currents in space that



# About the Minimoons

affect long-range communications. A coil in an instrument called a magnetometer will be energized and de-energized, setting up currents. These will be amplified, translated into code signals and transmitted back to earth by a system called telemetering.

**Q** *Why so many satellites?*

**A** One satellite could not report on everything that science wants to know. Each will gather specific information or related pieces of information.

**Q** *Will each satellite be packed with instruments?*

**A** No. They will be fairly empty. Space inside is needed to reduce heat generated by the circuitry. Moreover, there's a weight problem. The actual "bird" will weigh only about 21½ pounds, though the rocket that takes it up will weigh 11 tons at takeoff.

**Q** *How will the satellites be shot into space?*

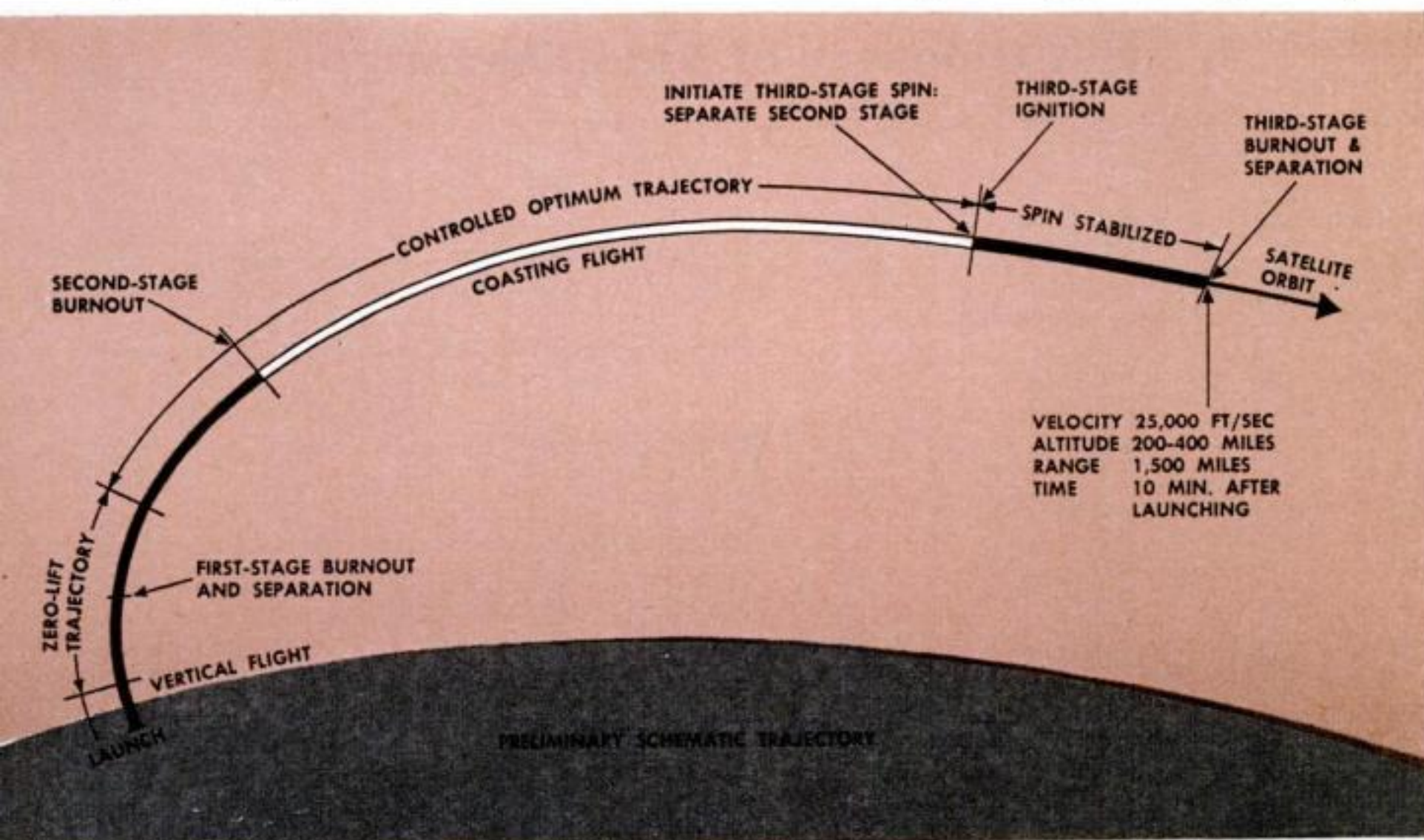
**A** The container, or "vehicle," for each satellite will be a rocket in three stages. The first-stage engine will boost the satellite to a height of about 35 miles. The casing of this engine will fall off at burnout. The second-stage engine will take the satellite to 140 miles, burn out and then, with the third stage, coast on up to 300 miles. There the second engine will drop off. Then the third stage will ignite.

**Q** *What speed will the satellite reach?*

**A** About 18,000 miles an hour.

**Q** *What fuels will the rocket use?*

**A** The first-stage engine will use liquid oxygen and gasoline, sili-





cone oil and a small amount of alcohol, the second stage nitric acid and a compound called unsymmetrical dimethylhydrazine, and the third-stage rocket engine will be powered with a solid propellant like gunpowder.

**Q** *How big will the rocket be?*

**A** It will be 72 feet long, and 45 inches through at its greatest diameter.

**Q** *Won't air friction burn up the satellite?*

**A** No. The satellite will be enclosed in a protective capsule in the nose of the rocket which will fall off during the second stage when the thinness of the air will reduce friction below the danger point.

**Q** *Will the satellites get beyond earth's gravitation?*

**A** No. It is gravitation that will prevent them from flying off into space. Centrifugal force will prevent them from falling back toward the surface of the earth.

**Q** *How high will they go?*

**A** A maximum of 1,500 miles as they orbit around the earth.

**Q** *How long will they stay up?*

**A** That depends on altitude. If the scientists succeed in getting them up only 100 miles, they probably won't complete even one circuit of the earth before they fall. If the satellites reach a "perigee"—a launching altitude into their orbits—of 300 miles, they might stay up for many months.

**Q** *Why will they come down?*

**A** Air resistance, ever so slight at that altitude but still existent, gradually will slow each satellite's speed. Then gravity will overcome the pull of centrifugal force.

**Q** *What will happen to them on the way down?*

**A** As they reach the denser air of the earth's lower altitudes, friction will burn them up. END

## A Brief Glossary of Satellite Lingo

**Aerodynamic heat**—that which is created by air friction.

**Apogee**—the farthest point reached in orbiting around the earth.

**Burnout**—exhaustion of engine fuel.

**Cosmic rays**—space rays of extremely high frequency caused by the transmutation of atoms.

**Inclination**—any angle from the vertical; specifically, the slant an earth satellite rocket will assume as it gains altitude.

**Ionosphere**—an area above 40 miles in height that reflects radio waves.

**Micrometeorites**—space "dust" that is expected to pit the satellite shell.

**Minitrack**—radio system to track satellites.

**Oblateness**—misshapeness of the earth due to the pull of centrifugal force at the equator.

**Perigee**—nearest point to the earth reached by a satellite in its orbit.

**Photon counter**—an instrument to measure light or radiation.

**Pitch**—a rocket's fore-and-aft oscillation as it flies through the air.

**Regression**—a gradual movement westward of a satellite's apogee and perigee points as flight time ages.

**Roll**—spin imparted to a rocket or satellite.

**Trajectory**—the path that is described by an ascending rocket.

**Yaw**—a side-to-side oscillation.



## Car Top Becomes Grandstand Seat For Whole Family

WHEN British motorists go to the races or "sporting meetings," they can enjoy the show in comfort. A portable seat, that folds for stowage in the trunk, is held in place by suction cups and clamps. A light-weight ladder and a felt-backed footrest to protect the paint go with it. The aluminum-alloy and wooden rig also comes in a two-man size.

▶▶▶ Leaky water mains no longer tie up streets in Britain. Instead of pick-and-shovel crews on a wide pavement-ripping search, harmless radioactive sodium bicarbonate tablets are put in the water system. A Geiger pole poked into small drilled holes then locates the leak.



## Camping Car-Trailer Has (Almost) All the Comforts of Home

Two adults and a couple of children can sleep in the DKW camping car. Among its features are a couch that opens into a double bed, built-in closets, a washstand and kitchen facilities. Ac-

cessories, such as the sun awning, shown attached to the car's rear entrance, are carried inside the trailer. Price for this three-cylinder, 25-miles-to-the-gallon, German job is quoted at below \$2,000.





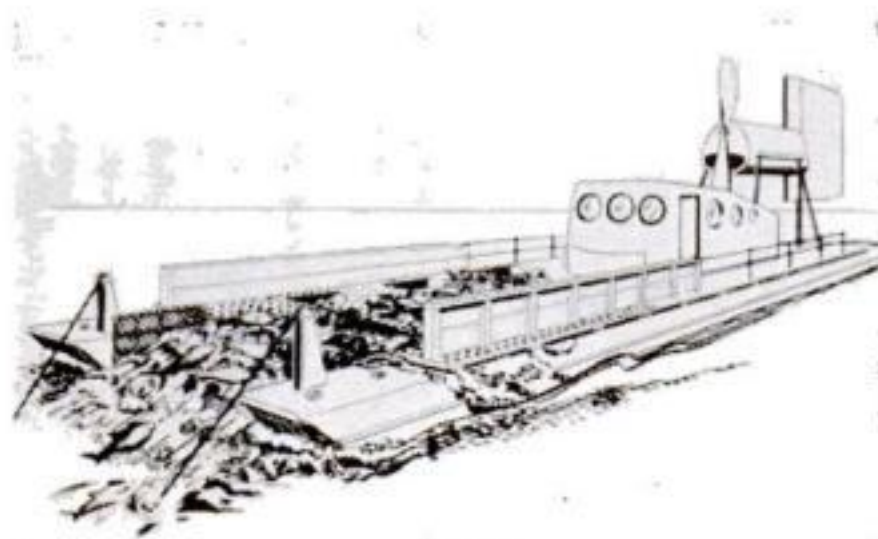
## Sea-Going Scoop Designed to Sweep Up Tuna by the Ton

GOING after big fish in a big way is the goal of Earle R. Mandle, a retired Seattle businessman who already has spent three years and about \$30,000 building his Trimaran Scooper.

First part of the name derives from the fact that it resembles a catamaran but has three hulls; the second part describes its job—scooping up fish.

Powered by a 520-hp. airplane engine that will drive it at 35 knots, the 60-foot-long Scooper will look like the drawing at right when it is finished. On reaching a fishing ground, a shovel-like

scoop in front will be lowered into the water. Tuna would then be funneled onto the craft's perforated-steel deck.



## They Say Now . . .

DR. WILLARD F. LIBBY, COMMISSIONER, ATOMIC ENERGY COMMISSION: "The most important bottleneck in the peaceful application of atomic energy is not money, not uranium—it is trained manpower."

DR. LAWRENCE R. HAFSTAD, DIRECTOR, GENERAL MOTORS RESEARCH: "Our choice is brutally clear . . . We can either learn mathematics and science—or Russian."

DR. DOUGLAS H. EWING, VICE-PRESIDENT, RCA LABORATORIES: "In this era of rapid technological change it is vital for the ex-

ecutive, if he is to exercise the best judgment, to know in detail what is happening or is about to happen in the technology which relates to his business."

DR. FARRINGTON DANIELS, UNIVERSITY OF WISCONSIN: "Unlike atomic energy, solar energy has no critical mass, no health hazards (except sunburn), and no waste products to dispose of."

CRAWFORD H. GREENEWALT, PRESIDENT, E. I. DU PONT DE NEMOURS & Co.: "Behind every advance . . . is a germ of creation growing in the mind of some lone individual . . . whose dreams waken him in the night while others lie contentedly asleep."





***You're about to tackle a woodworking job—you have the plans, the tools and the time. But then a question pops up that can turn into a real stumper:***

# What Wood to Use?

**By Sheldon M. Gallager**

**Y**OU have as many choices when you buy wood nowadays as you have on Saturday at the supermarket.

There are 30 to 40 varieties of plywood alone. Such local favorites as southern magnolia and wormy chestnut are spreading fast to other parts of the country. Some imported hardwoods are becoming plentiful at prices as low as or lower than many of the common woods.

The more choices you have, the more important it is to pick the right wood. The wood that you use determines not only how your project will look, but also what it will cost, how easy it will be to make, what finish it will take, and how well it will stand up under the job that it must do.

***Where do you start?*** Wood is like art—you know what you like, and no one can tell you different. But you can't choose it properly without first deciding what general effect you want to create. Do you want a light natural finish,



a dark natural finish, or a painted finish? If your wife has her heart set on a blond modern radio cabinet, there's no point in making it out of mahogany. If she really wants a nice gleaming enamel finish, expensively grained hardwood is a waste of money.

Except for a few specialty finishes, it's usually best to pick a wood with a natural appearance similar to what you want. Here are some of the woods that will give different effects:

Light woods	Dark woods	Painted
Ash	Cherry	Basswood
Beech	Chestnut	Gum
Birch	Elm	Pine
Maple	Mahogany	Poplar
Oak	Walnut	Spruce

**Paint problems.** Fir and redwood are frequently added to the list of woods to be painted, but they are highly porous and require careful filling to give a satisfactory finish.

On plywood, you're pretty much stuck with fir, but there are special sealers and fillers that help you to do a good job. For really slick painting and staining, you can get a clear-pine plywood at slightly higher cost than fir.

On solid stock, you can get the best paint finishes by sticking to the high-grade pines and spruces if you live in the North, and to gum, poplar and basswood if you are in the South.

**Construction affects choice.** If you are making a cabinet, bookcase or built-in, the wood will be formed into a box-like or "case-type" structure. Thanks to its rigidity, you need not worry much about its strength. The same holds true where a facing of wood is applied over a surface or frame.

On "open-type" structures, such as chairs and tables, you need strong, stiff woods that can withstand strains. For table tops and other areas that get heavy use, you want hard, dent-resisting woods that will take the blows from Junior's tomahawk.

Most hardwoods are stronger and harder than most softwoods, but this isn't

[Text continued on page 133]

## A Color Handbook of Woods That You Can Fold and Keep



**W**ANT to know just what limba looks like, or how to tell the four mahoganies apart? Here's a full-color, actual-size picture guide to 21 of the most useful and beautiful woods. You can use it to help plan woodworking projects, then take it right along with you to the lumberyard.

To make this handbook easy to carry and save, it's printed as a compact, pocket-size booklet that you can clip out and fold together in a few minutes. Cut out the next two pages along the thick black lines. Fold the top half of each page down behind the bottom half, then fold the two sheets in half again lengthwise. Nest the second folded page inside the first, and cut off the top folds as shown in the photo above. Staple or clip the leaves together at the center fold, and you will be able to turn quickly to each wood and its description. The wood-sample pictures were made with the help of the Hardwood Plywood Institute, United States Plywood Corp., and Albert Constantine and Son, Inc.



FIRST: CUT OUT ALONG THIS LINE

## Knotty Pine

A long-favored, inexpensive wood for paneling and cabinet-making, knotty pine is not a type, but a name given to the lower, knot-filled grades of several types, most common of which are white pines. All are cream to yellowish brown, sometimes tinged with red, and darken substantially with age. They are usually straight-grained, easily worked, but may have loose knots, cracks and pitch pockets. Idaho white pine is often preferred because knots are small and tight.

## White Gum

The light-colored sapwood, or outer growth, of sweetgum is called white gum. Often clear, off-white, it is almost grainless with less mixed with some darker heartwood. It takes stain well, is moderately hard.

## Red Gum

This wood comes from the same sweetgum as white gum, but is the brown or reddish brown heartwood, often beautifully figured with deep, rich markings. It is relatively cheap in the South.

• • • • • THIRD: FOLD HERE TOWARD YOU • • • • •

## Cherry

This wood is often called black cherry, wild cherry, or choke cherry. Texture ranges from fairly even to moderately contrasting depending on type of saw cut. Color varies from light to dark red-dish brown with a high, distinctive luster. It takes a high finish. Strong, stiff, moderately hard and heavy, cherry has high resistance to shock and denting, but is not easy to work. Although it has rather large shrinkage, it stays in place well after seasoning. Cherry grows throughout the East.

• • • • • SECOND: FOLD HERE AWAY FROM YOU (THIS SHEET ONLY) • • • • •

POPULAR  
SCIENCE  
Monthly

# 21 Useful Woods

**How to  
identify  
them**



Large pores, unlike those in red oak, are plugged with small growths, making filling easier. Both oaks are hard, not readily worked with hand tools. Grayish brown, it comes from East, South and Central states.

## White Oak

One of the toughest furniture woods. The open grain, however, requires filling for a good finish. Wood is brown with reddish tinge, has fairly high shrinkage. It comes mainly from the East and South.

## Red Oak

Usually called black walnut, this wood is a popular choice for fine furniture, either modern or traditional. The grain is straight but moderately prominent; the color varies from light to dark chocolate brown, with occasional deep, almost black streaks. Walnut is hard, heavy, strong, resistant to shock and denting, yet relatively easy to work. It has low shrinkage and high stability, and develops a fine, smooth natural finish. Walnut grows from Vermont to Great Plains and south to Texas.

## Walnut

## Maple

Two main hard types — sugar and black — vary from white to light reddish brown. They are stiff, strong, usually straight-grained with uniform texture, but shrink greatly, need good drying.

## Bird's-Eye Maple

A variety of hard or sugar maple in which the grain produces small, eyelike swirls. The overall honey color has light and dark flecks. Other figured maples are curly and wavy.

## Birch

One of the most widely used cabinet woods. It is light tan to reddish brown in color, and has a fine, close-grained, uniform texture that takes a beautiful natural finish. Hard, heavy, stiff, strong, highly resistant to shock and denting, birch is not easy to work with hand tools. The two varieties most often used for furniture — yellow birch and sweet birch — grow in the northeastern and Lake states and along the Appalachian Mountains as far south as Georgia.



Often a deeper reddish brown than African mahogany, this wood is slightly coarser, but has smaller pores. Grain is straight, beautifully figured.

## Honduras Mahogany

Considered the king of furniture woods by many cabinetmakers, African mahogany is medium hard, highly stable, with low shrinkage. The color is pale reddish brown.

## African Mahogany

Slightly less firm in texture than dark red type, this type has same hardness and durability. It is light yellowish red.

## Philippine Light Mahogany

While not a true mahogany, this import is closely similar and cheaper. Medium hard, dark brownish red, it has open pores but firm texture.

## Philippine Red Mahogany

FIFTH: FOLD HERE AWAY FROM YOU (THIS SHEET ONLY)

## Ash

Extremely strong, stiff and resistant to shock, it is brown, with fairly prominent grain markings. Ash is very hard, not easy to work. Most comes from East; slightly lower-strength type grows in Oregon.

## Limba

This low-cost African hardwood has many of the fine, smooth, tight-grained characteristics of expensive hardwoods. Tradenamed Korina, it is blond, almost grainless and takes a high luster.

## Red Cedar

Two main types—Western and Eastern—have a high resistance to decay and a mild aromatic odor (not the strongly spicy odor of incense cedar). Eastern type is red, often quite bright, has a fine, straight-grained, uniform texture but many knots. Western type has fewer knots but rather coarse texture, is a duller, darker reddish brown. It is softer, lighter and less resistant to shock than Eastern cedar. Both types have very low shrinkage, stay in place well, and work easily.



## Elm

Two classes—hard and soft elm—are similar, but vary slightly in weight. Both are moderately strong, stiff, bend well and have high resistance to shock. Color varies from pale to dark brown, often reddish-tinged, with light and dark stripes. Despite open pores and rather coarse texture, it stains and fills well, has a medium luster. Of the six domestic varieties, slippery or red elm (usual-ly marketed as northern gray elm) is best for cabinetwork, having a softer, more even texture and color.

## Redwood

Along with cypress, redwood is one of the most durable woods for outdoor use. Color varies from light pinkish red to dark reddish brown. Mild grain is straight with a smooth, silky sheen, fine pin knots and thin, fairly prominent dark lines. It is moderately light, strong, stiff and hard, easily worked with hand tools. Redwood shrinks and swells little, but is highly porous, requiring careful sealing. Inexpensive in the West, it is produced mainly in California.

## Beech

There is only one domestic type, but it is often divided into "white" and "red" beech because color varies widely from pale brown to deep reddish brown. Hard, heavy, strong, it has good resistance to shock and abrasive wear. Beech is not easily worked with hand tools, but steam-bends well and machines smoothly with power tools. There is little grain pattern, but a fine, uniform texture and medium luster. Large shrinkage requires careful drying. Grows mainly in the East.

## Cypress

Technically known as bald cypress but popularly as red, yellow or white cypress, this wood is especially resistant to decay, making it a durable outdoor material available in the East and South. It has a straight, mild grain and stains well. Color varies widely from light yellowish brown to dark reddish and chocolate brown. It is moderately strong, hard and heavy, but works easily. When it contains pock marks caused by fungus decay, it is sold as pecky cypress, for paneling.

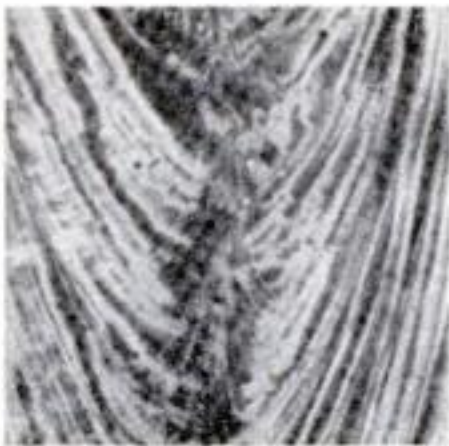
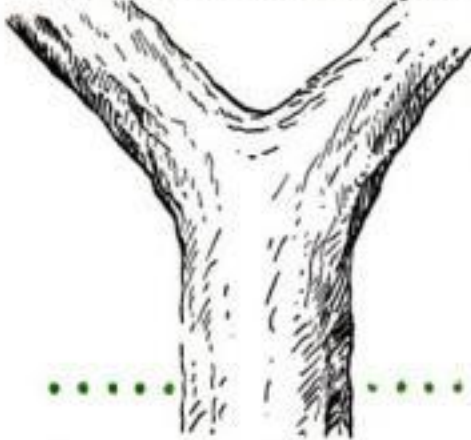


How you can tell different wood patterns apart

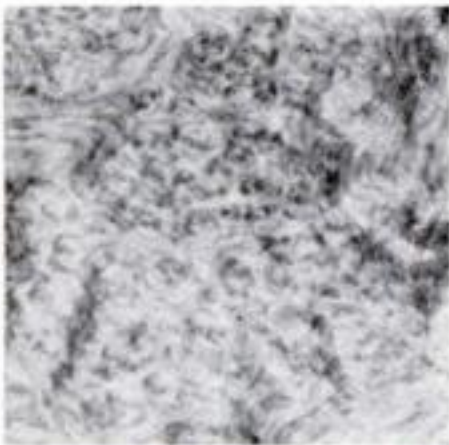
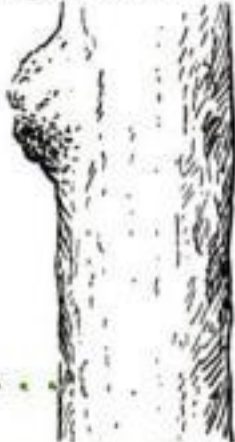
BY WHERE THEY ARE FOUND

BY THE WAY THEY ARE CUT

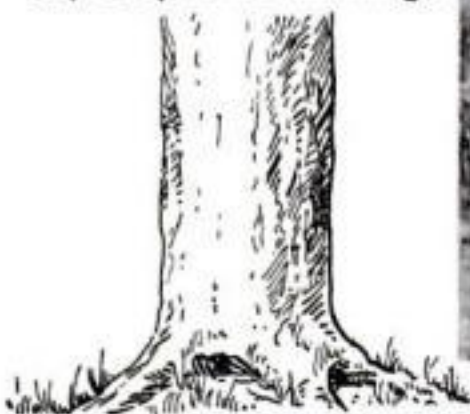
Crotchwood: V-shaped pattern where branches join



Burl: small, tight swirls fanning out from a center



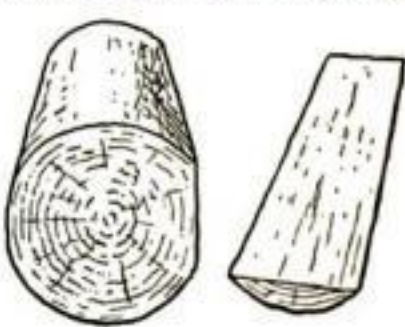
Stumpwood: rich, irregular, deep-toned markings



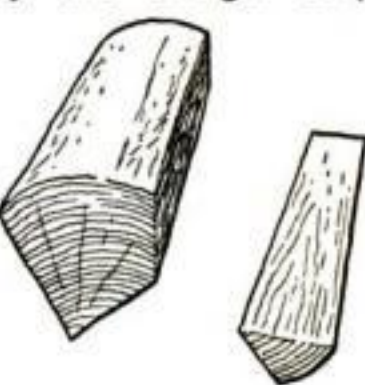
Rotary-cut log: prominent, often wild pattern



Flat-cut log: irregular, but milder than rotary



Quarter-sawed log: usually fine straight stripes



[Continued from page 128]

true in all cases—as you can see by studying the list below:

HARDWOODS		
High strength	Medium strength	Low strength
Ash, hard	Ash, brown	Ash, soft
Beech	Chestnut	Basswood
Birch	Elm	Butternut
Cherry	Gum	Cottonwood
Hickory	Magnolia	Poplar
Maple, hard	Mahogany,	Willow
Maple, soft	Honduras	
Oak	Mahogany,	
Walnut	Philippine	
SOFTWOODS		
Pine, hard	Cedar	Fir, white
	Cypress	Pine, white, sugar,
	Fir, Douglas	ponderosa
	Redwood	Spruce

When you pick a wood, go by the actual rated strength, not by the term

“hardwood” or “softwood.” Hardwoods come from broadleaf, deciduous trees that shed their foliage; softwoods from evergreens that retain their foliage.

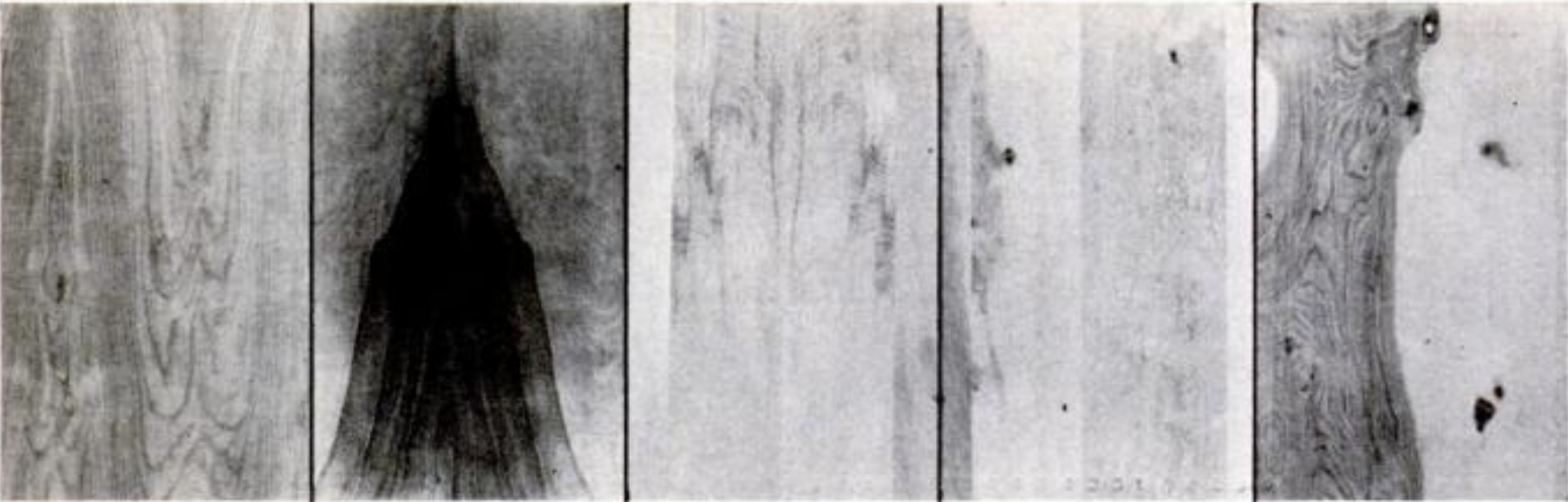
**Plywood vs. solid.** Plywood is fast becoming the favorite of many professionals because it saves labor. A single piece covers a large area, thus eliminates edge-gluing and cleating narrow boards. Plywood, moreover, will not shrink, warp, crack or split, as solid woods may do.

Hardwood plywoods like birch, cherry, mahogany and walnut provide fancy surfaces at relatively low cost—you pay only for a thin veneer which has a fine uniform grain pattern.

But you have to buy relatively large sheets, so you may find it wasteful for small projects. Also, plywood edges are not as easy to make attractive as solid



Hardwood-plywood grade names help you make the right choice



- CUSTOM GRADE** For best natural finishes. Veneers are selected for clear, uniform patterns. You need this grade if you want to match grain exactly.
- GOOD GRADE (1)** For high-grade natural finishes. Wood has ordinary, random grain markings, occasional small burls, pin knots and some streaks.
- SOUND GRADE (2)** For smooth painting. Veneers are not selected for color or appearance, but are firm, smooth and free of any physical defects.
- UTILITY GRADE (3)** For rough paint and natural finishes. Has tight knots and burls, fine splits, discolorations, and holes, but no decay.
- REJECT GRADE (4)** For construction uses where appearance does not matter. Has knots, splits and other defects that do not impair its strength.

wood and they do not hold screws well.

Because the veneer on plywood is thin, it cannot be planed down and refinished when it becomes gouged or dented.

**What do they cost?** In price, the difference between plywood and solid wood depends a lot on where you live and on the thickness of wood that you will need. Except for knotty pine and a few other cheap softwoods, plywood in the 1/8" to 1/4" thicknesses is less expensive than equivalent solid planks.

For paneling, the thin plywood sheets are also easier to put over existing walls. You don't have to use furring strips or reframe door and window casings to allow for the added wall thickness.

When you get up into the 1/2" and 3/4" thicknesses, fine-wood plywoods may not save you money except in areas where the equivalent solid woods are scarce. Where the solid woods are plentiful, they are likely to be cheaper than plywood. Two exceptions are limba plywood and Philippine-mahogany plywood, made from imported hardwoods, which sell for less than most domestic hardwoods in either solid or plywood form.

**How well will it finish?** The dense, hardwoods like hickory, maple and birch finish beautifully, but are not easily worked with hand tools. Woods like redwood are easy to work, but are too soft to take a high, hard polish.

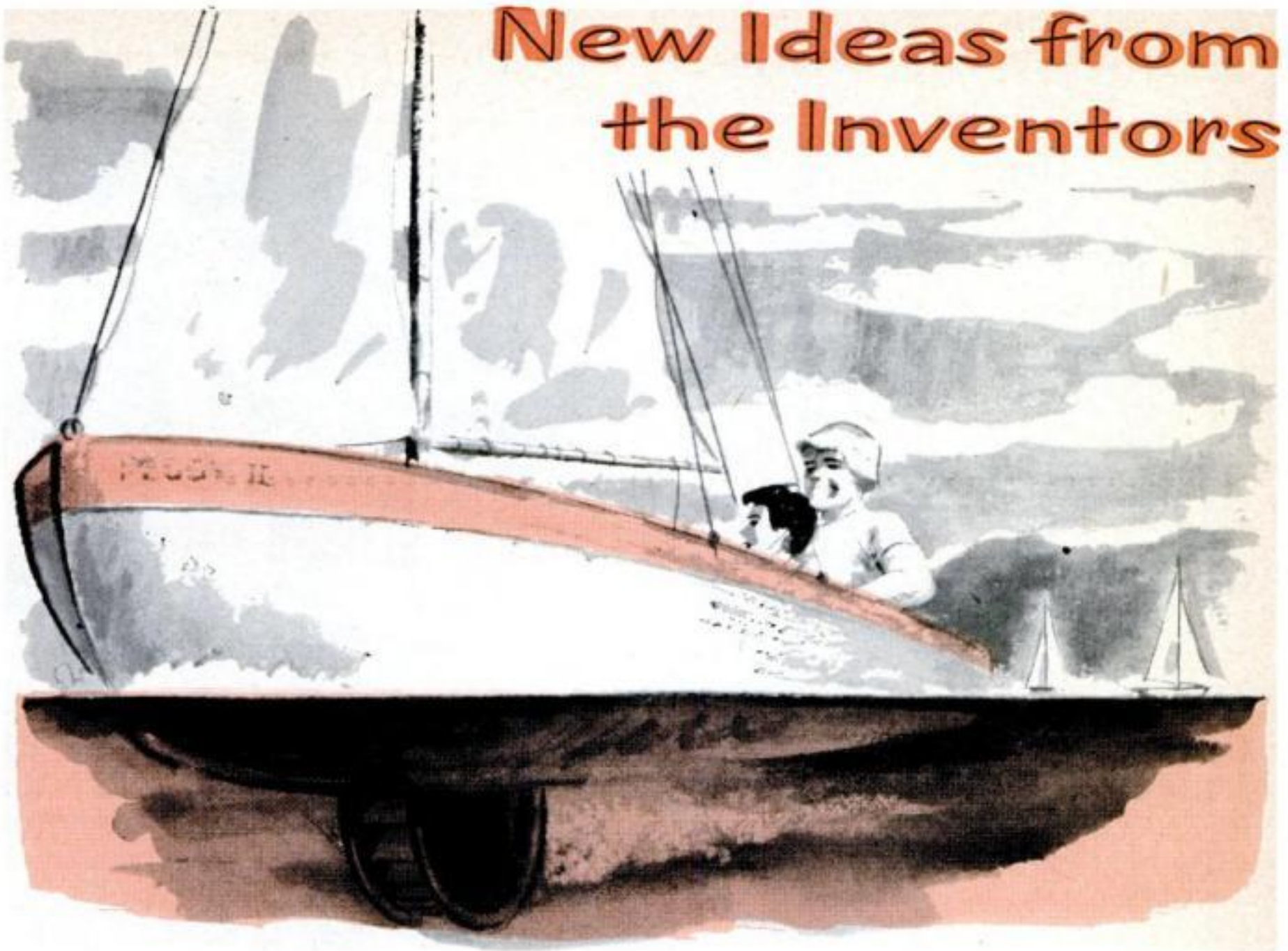
Woods that sand smooth and take a high-sheen finish easily are listed below as "good." Those that take a good finish but require more work are called "medium." Those that take a soft, fuzzy or dull finish are listed as "poor."

	Ease of working	Resistance to splitting	Ease of finishing
Ash, hard	Hard	Poor	Medium
Beech	Hard	Poor	Good
Birch	Hard	Poor	Good
Butternut	Easy	Good	Medium
Cedar	Easy	Poor	Good
Cherry	Hard	Poor	Good
Chestnut	Easy	Medium	Poor
Cypress	Medium	Good	Poor
Elm	Hard	Good	Medium
Fir	Medium	Poor	Poor
Gum	Medium	Medium	Medium
Hickory	Hard	Poor	Good
Magnolia	Medium	Medium	Good
Mahogany, Honduras	Easy	Good	Medium
Mahogany, Philippine	Easy	Good	Medium
Maple, hard	Hard	Poor	Good
Maple, soft	Hard	Poor	Good
Oak, red	Hard	Medium	Medium
Oak, white	Hard	Medium	Medium
Pine, hard	Medium	Poor	Medium
Poplar	Easy	Good	Good
Redwood	Medium	Good	Poor
Spruce	Medium	Medium	Medium
Walnut	Medium	Medium	Medium

[Continued on page 212]



# New Ideas from the Inventors



## 1 Paddle Keel to Move Calmed Boat.

This motorized center wheel is intended to steady a sailboat and propel it without impeding normal movement.

On land, it would make portage easier. For shallow-water navigation, the paddle would retract into a well. A hand crank would be provided for low speeds.

## 2 Shoe Heel to Convert.

With telescoping heels on her shoes, a lady who liked to travel in comfortable low heels could look stylishly high-heeled on arrival. The inventor (a man) also says that, after wearing high heels, women "long for" a change that will give their feet a rest.

## 3 Vent to Adjust Itself.

Once you opened this spring-pivoted car window, it would automatically maintain uniform ventilation regardless of car speed. Increased wind pressure on the glass would narrow the vent opening; decreased pressure would make it open.



Please turn the page for more new ideas

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## More New Ideas from the Inventors



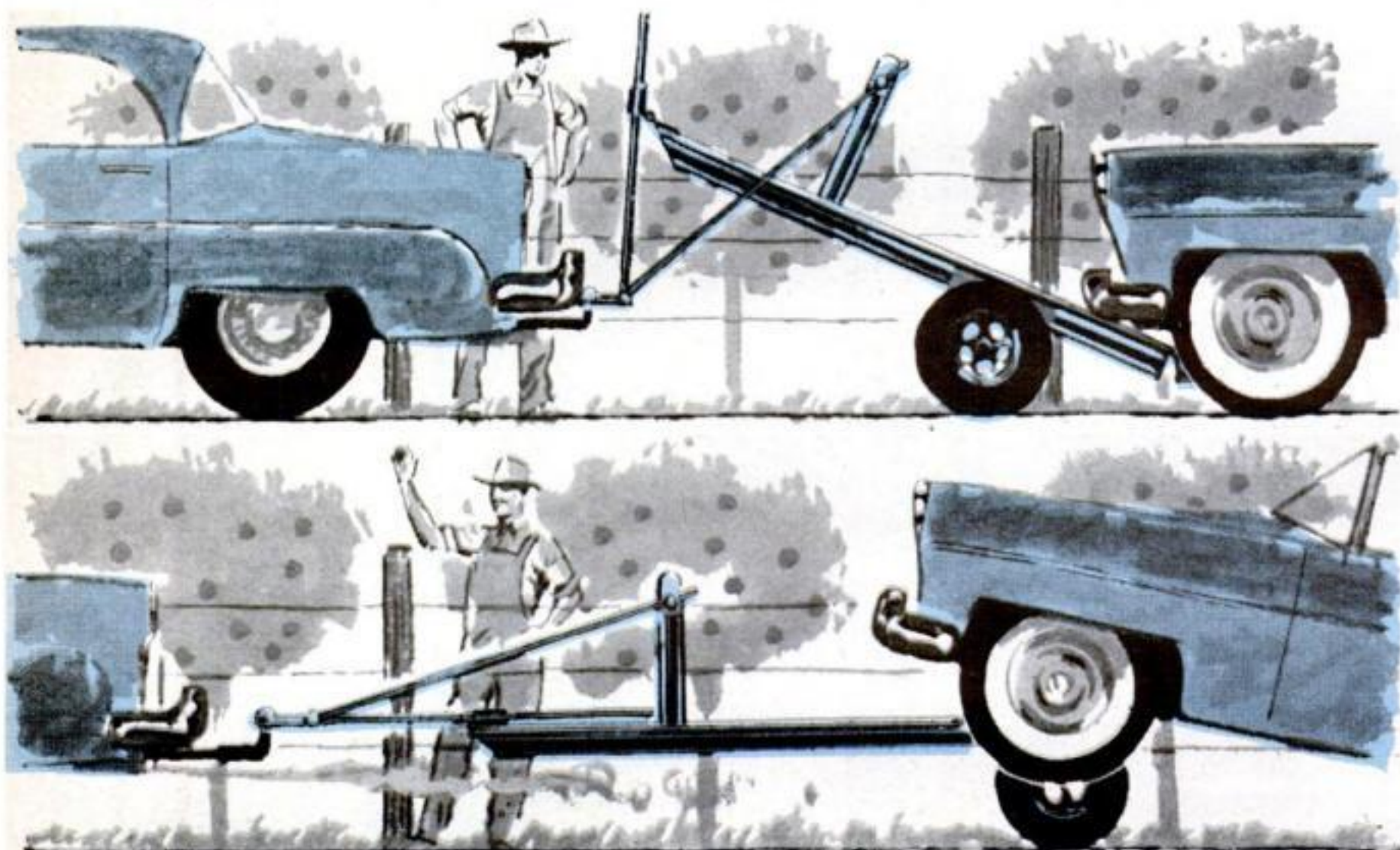
**4 Squeezer to Empty Tube.** The contents of one-shot collapsible tubes—of the kind used for paint colors, antibiotics, cattle medicines and the like—could be expelled more quickly, completely and uniformly, with the help of a pliers-type squeezer like the one shown here.



**5 Water Skis to Float or Glide.** While you were being towed at speed, the wooden runners of these skis would skim the water in the usual way. When you stopped moving, the inventor claims, blocks of buoyant plastic on the ski tops would keep you standing on the water.

**7 Wheeled Hitch to Ease Tow.** With this trailer-like dolly, an ordinary car could easily tow and steer a disabled vehicle larger than itself. With dolly

wheels temporarily braked, motion of the lead car would jack up the follower and move it and the dolly frame forward over the four-wheeled axle.







**6 Pot Lid to Stir the Food.** For foods that need to be stirred often while they cook, this pot cover could be a real time and work saver. Spoons, suspended from a spring-rotated plate and working through gears, would do the stirring thoroughly and automatically.

**8 Roller to Imprint Paper.** Instead of stocking up on rolls of preprinted paper, a shopkeeper could use this printing dispenser to print his advertisement or message on each sheet as he used it. The device would automatically measure out the right length of paper and stamp it with a quick-drying ink.



**9 Suit to Keep You Cool.** Dry ice, a network of channels, and the weight of cooled air—which would flow down, forcing hot air up—would keep cool currents moving inside this refrigerated suit. Full garments could be worn by desert marchers, fire fighters, and the like, but lighter jackets might be tailored for ordinary wear during the summer months.

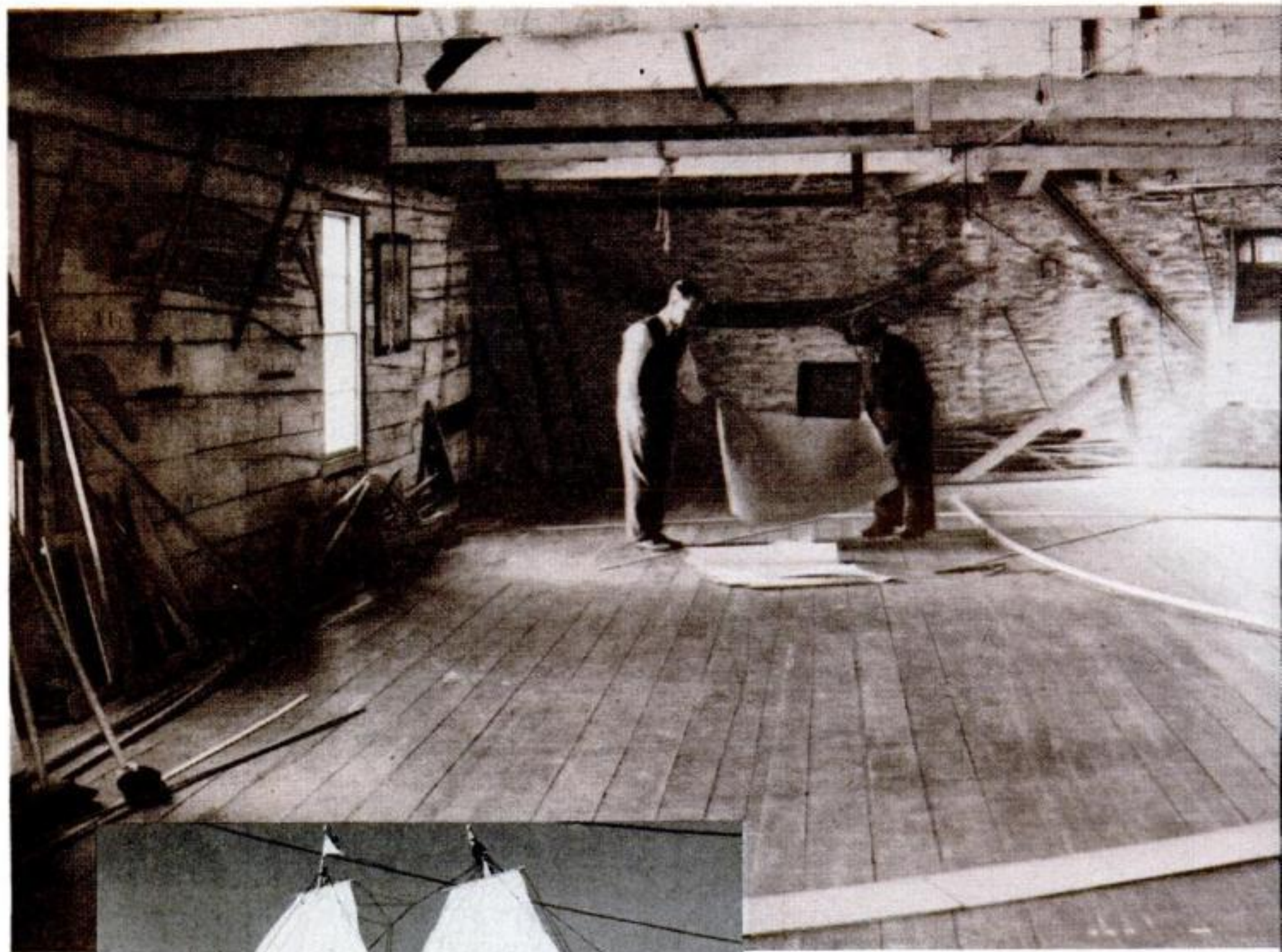
The following patents have been issued on these inventions: 1. Patent No. 2,717,571 to Gordon Petty, Chicago; 2. No. 2,707,341 to Frank Romano, Brooklyn; 3. No. 2,693,355 to Alfred Puccinelli, Briarwood, N. Y.; 4. No. 2,723,050 to Maxson Montgomery and Norman Helmer, Long Beach, Calif.; 5. No. 2,716,246 to James Billingham, Kalamazoo, Mich.; 6. No. 2,719,703 to Isabella Boakes, Woodbury, N. J.; 7. No. 2,699,267 to Birnie Beamer, Fort Wayne, Ind.; 8. No. 2,719,482 to William Selley, Brooklyn, and John Connolly, Pelham, N.Y.; 9. No. 2,731,808 to Virgil Stark, New York City.

Copies of patents may be ordered, by number, from the Commissioner of Patents, Washington 25, D.C. at 25 cents each. To write to an inventor, if the address given above is insufficient, you may address him (by name and patent number) in care of the Commissioner of Patents.



A marine architect turns detective, modern shipwrights learn old skills in

# Building a New Mayflower to Re-enact Historic Voyage



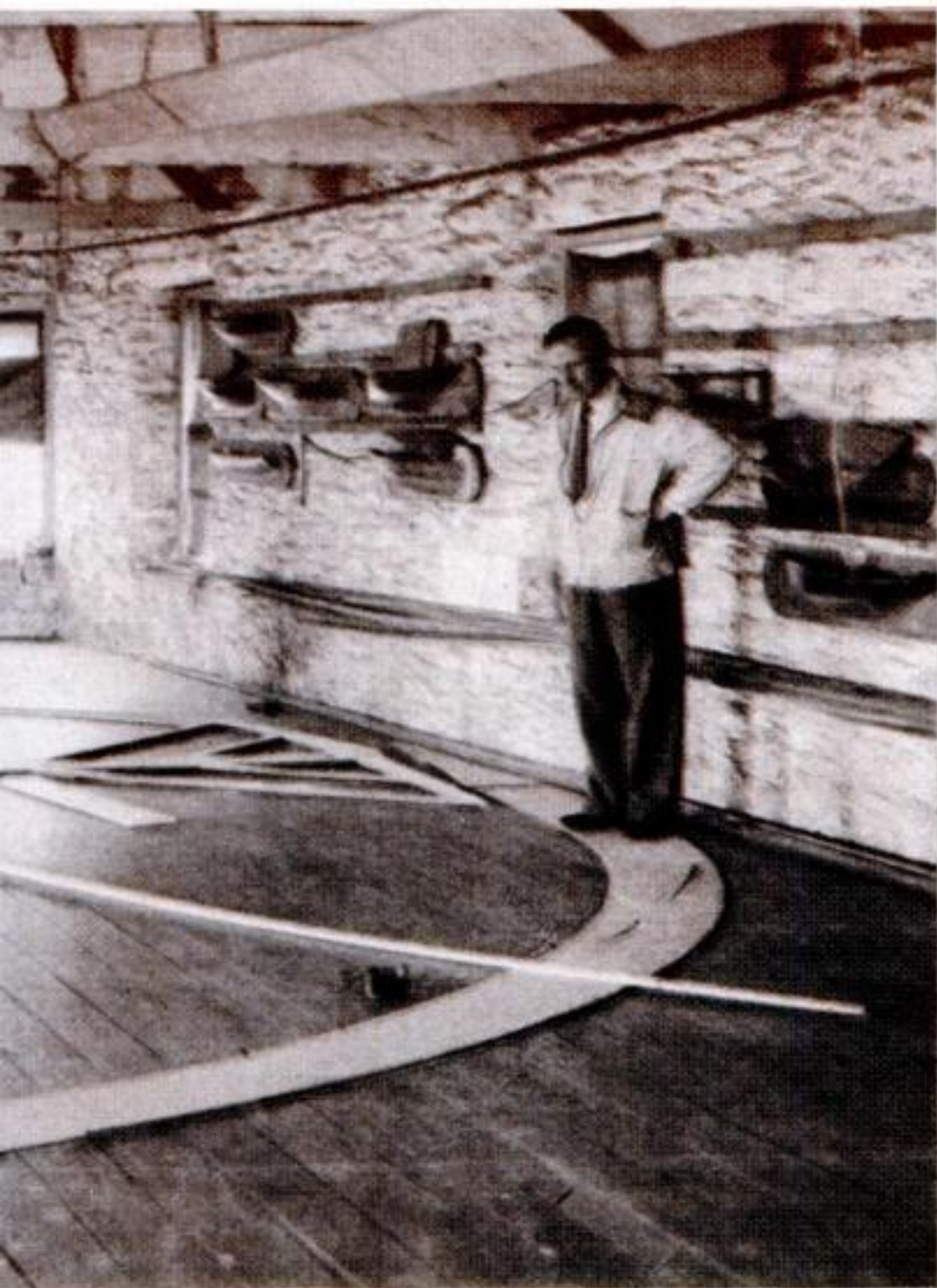
**A RIB FOR THE MAYFLOWER** is laid out on the mold-loft floor at Upham's Shipyard in Brixton, England. The wooden template made here will later be used as a pattern on the building way.

**SCALE MODEL** of ship now a-building was made in England from plans drawn up by American marine architect William Baker. The full-size reconstruction will be ready for sea in a few months.



**PLYMOUTH HARBOR,  
DEVON**

Memorial arch (center) marks the place where Pilgrims left England in 1620. The new *Mayflower* will sail from the same harbor next year.



**PLYMOUTH HARBOR,  
MASSACHUSETTS**

Granite portico (right) covers Plymouth Rock, historic site of the Pilgrim landing. Ship will drop anchor nearby after Atlantic crossing.



**By Erik H. Arctander**

**J**AMMED into a 90-foot sailing ship built for cargo, 102 Pilgrims left Plymouth, England, on the sixth of September, 1620. Two miserable months later their square-rigger, the *Mayflower*, hove to off the wild New England coast.

Next spring, in a vessel that her designers hope will be exactly like the original *Mayflower*, a hardy crew of seafarers will re-enact that voyage made 337 years earlier. The first *Mayflower* was scrapped four years after her historic voyage. The new one will be afloat by early 1957. It is about half finished.

*How the ship came to be built* is a saga as studded with obstacles as the first *Mayflower* voyage. The idea of re-enacting that epic originated 10 years ago in the mind of Major Warwick Charlton, then a 27-year-old British army officer. World War II had just ended and he was sailing home from India when a book about the Pilgrims and their ship jiggled his publicist's imagination. Here,





**AN ADZE**, the 17th-century shipwright's favorite tool, hews *Mayflower* rib to 1/16" accuracy.



**TWO-MAN SAW** makes slow progress through solid oak timber. No power tools are being used.

**BLOCK AND TACKLE** attached to a chain sling hoist a laminated rib section into place.



he thought, was a really dramatic way for Englishmen to call attention to their common heritage with Americans and show their friendship in the bargain.

Major Charlton finally infected enough other people with the *Mayflower* bug to lay serious plans about two years ago. Three barriers had to be hurdled:

- There were no plans, good models, pictures or descriptions of the ship.
- There were no shipwrights skilled in using 17th-century hand tools or building methods.
- There were no seamen trained to sail a square-rigged ship like this one.

**The first big break** for Charlton and his handful of associates came in April, 1955. While visiting Plymouth, Mass., they discovered that William Baker, an American marine architect, was already drawing up plans for an accurate reproduction of the *Mayflower*. Baker had been commissioned to make them early in 1951 by Plimoth Plantation, a non-profit historical foundation that has been reconstructing an early Pilgrim settlement in modern Plymouth.

The six foundation governors, headed by Henry Hornblower II of Boston, voted their enthusiastic support for the British venture and directed Baker to turn over the plans completed so far to Stuart Upham of Brixton, England, a shipbuilder.

With Baker's plans for the hull before him, Upham laid the keel of *Mayflower II* on July 28, 1955. Since then additional plans and details have been airmailed over as Baker finished them. When questions need a fast answer, the Baker-Upham collaboration goes on by cable and transatlantic telephone. It hasn't been easy: Baker designs 20th-century ships for Bethlehem Steel Shipbuilding Co. in Quincy, Mass., and Upham builds yachts.

It should be a cinch, you would think, to reconstruct a famous wooden ship only 90 feet long and 24 feet wide. But Baker discovered when he began investigating in 1951 that the *Mayflower* was virtually a mystery ship. The only first-hand mention of her appears in William Bradford's *History of Plimoth Plantation* and it is too brief.





Deck beams are added to a well-advanced hull skeleton in this April view of the Mayflower.

Baker then tracked down authoritative models of the vessel. He found that all of them were guesses based on British merchant ships of the 17th century.

**Establishing the date** of the *Mayflower's* birth took clever detective work, since there were over a dozen ships of that name. But, Baker learned, she was the only *Mayflower* skippered by a captain named Christopher Jones. A painstaking search through English port records traced Captain Jones and his vessel back to 1609. Some complicated deductions involving Jones' relatives pushed the *Mayflower* launching back to 1606.

Baker slowly piled up a mountain of detail on early 17th-century merchant

ships built in northwest Europe. Early in 1952 he spent six weeks researching museums and nautical records in England, Denmark, Sweden, Holland and France. Ship design was similar in all.

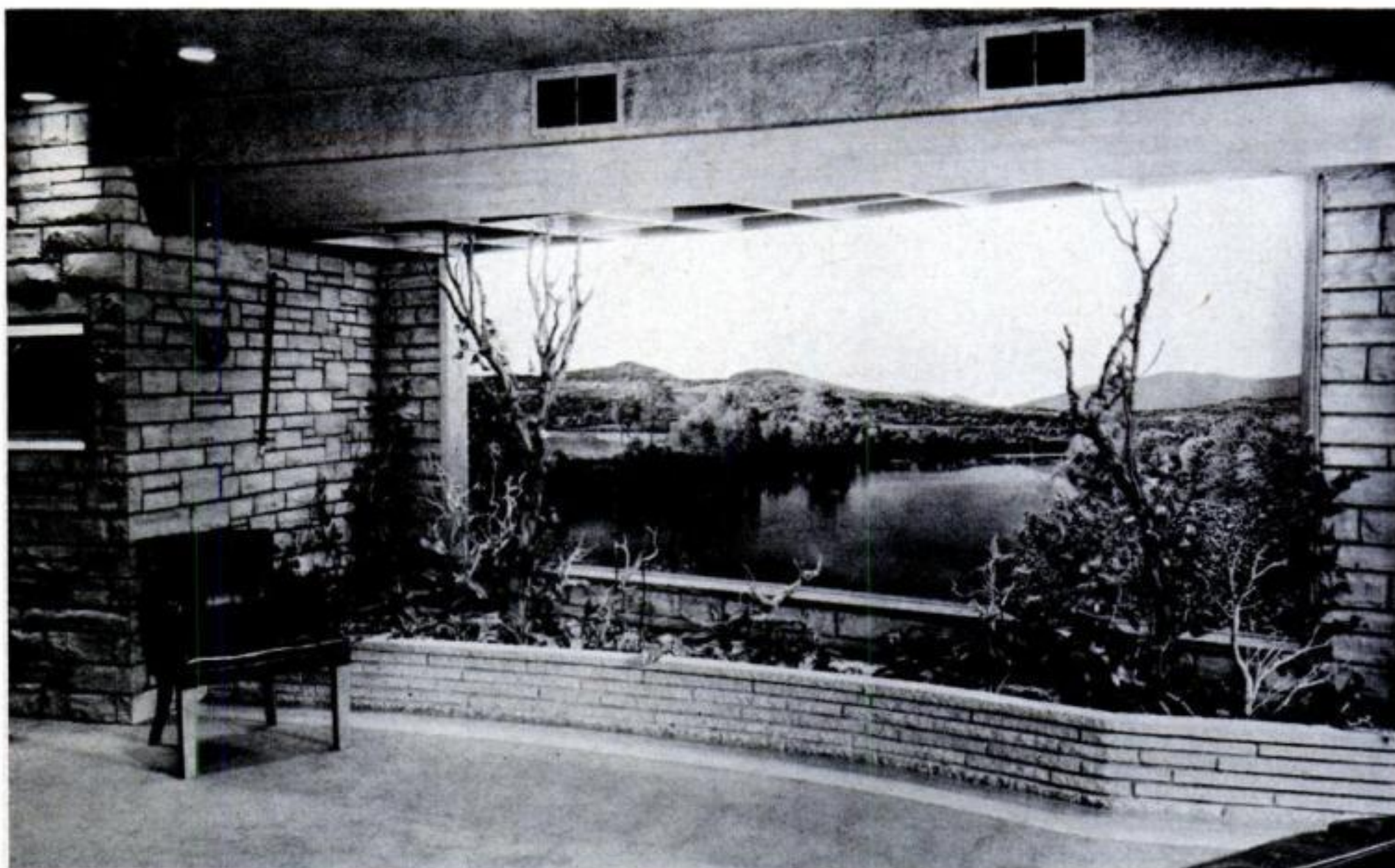
Baker flew home with a suitcase full of photographs, sketches and notes. He had also made many valuable friends during this trip who later helped him solve minor problems by taking more pictures or answering questions by mail.

**Ship models** were a great help, though models of naval vessels far outnumbered those of merchant types. Old nautical charts were useful, too—the engravers filled empty spaces on them with draw-

[\[Continued on page 214\]](#)



# New Aids to Living

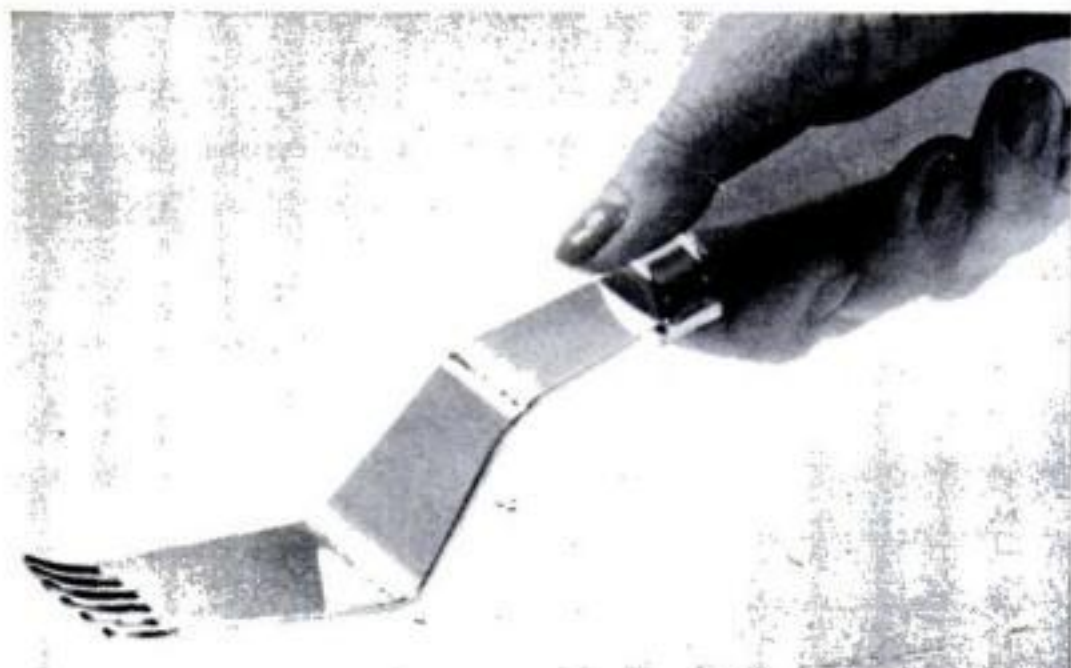


**1 Scenic "picture window"** 15 feet long brings the seashore or mountains into a city living room. Applied to the wall in sections like wallpaper, the mural is then framed. A valance and drapes will fur-

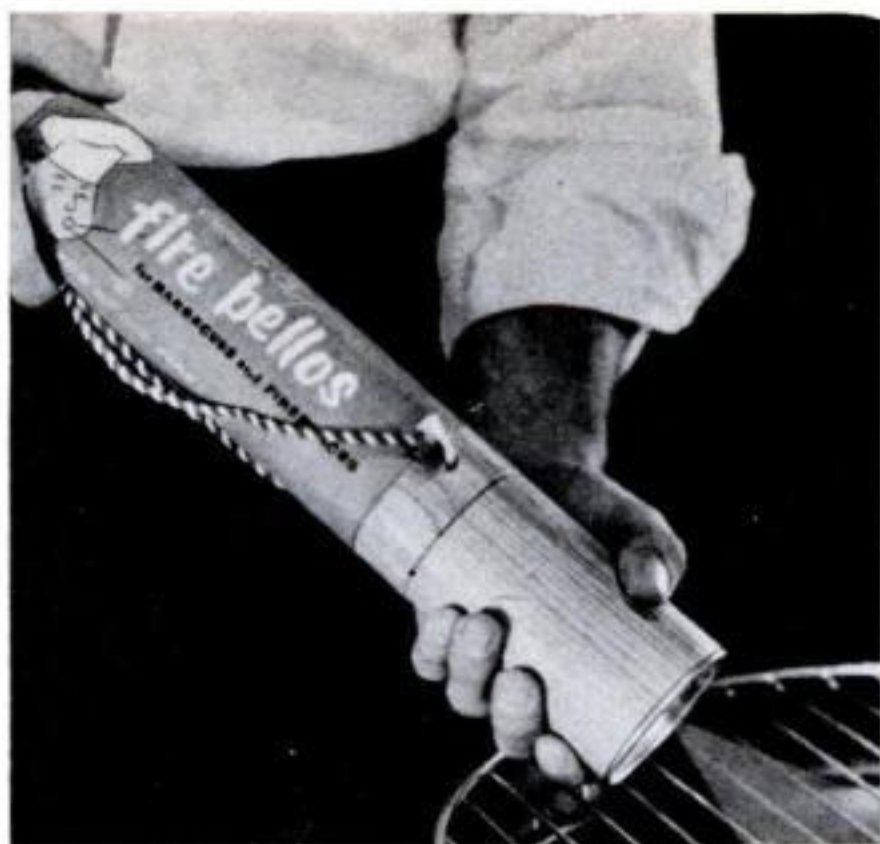
ther the illusion of a window. Murals come in full color for \$79.50, in black and white for \$39.50. For smaller walls, there's a five-foot transparency that can be backlighted with a special lamp.

**2 Disappearing clothesline** is mounted on a reel (inset) inside the garage. On wash day the line is pulled through a hole in the wall and anchored to a post or hook. When this end is released, the line snakes back and rewinds automatically. A cap on the end seals out rain.

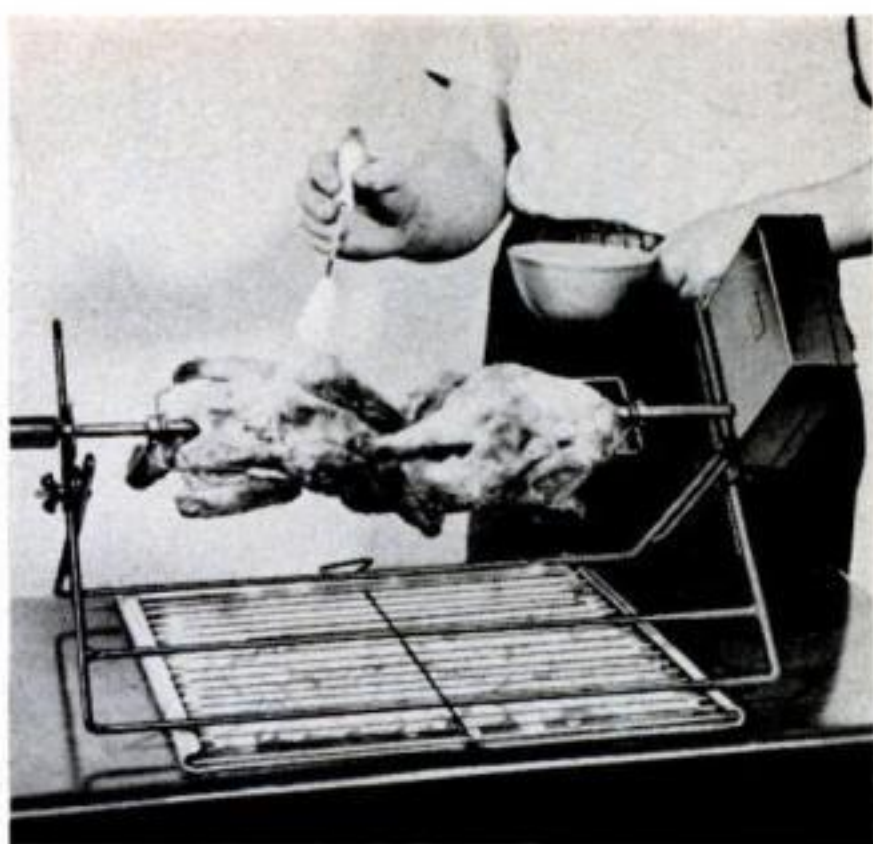
**3 Crab jack** makes short work of digging out crab grass, dandelions and other ground-hugging weeds. The sturdy prongs are inserted just below the surface under the plant and pressure on the handle lifts out the weed, root and all. Reversed, it makes a good cultivator.







**4 Fire bellows** work like a bicycle pump to speed up chow call for hungry barbecue diners. A few strokes pump jets of air into ignited charcoal, turning the bed into live, glowing coals. And at the end of the outdoor-cooking season you can strip off the label that hides the wood-grain cover and hang the bellows in a handy spot beside your indoor fireplace.



**5 Powered barbecue spit** has no cord to plug in and uses no batteries—it gets its muscle from a heavy-duty spring motor. One setting keeps it turning for an hour, but you can stop or start it at will. The devices come with 20- or 26-inch spits. Either is adjustable in height for different roasts, and both of them will fold flat to fit a carrying case.



**6 Space makers** for refrigerators hook over the regular shelves to provide double-decker storage for flat bowls and packages. The extra shelves can be raised or lowered to meet changing needs.



**7 Squeeze nozzle** for garden hose gives fingertip control of water flow. A thumb lock holds it open for a gentle sprinkle or a powerful jet stream. The outer end is threaded for swapping spray heads.



**8 Back-yard bubbler** turns any outdoor faucet into a handy drinking fountain. When a hose is in use at the lower end of the aluminum pipe, the water flow is diverted from the plastic cup of the fountain.

**More information** about the products shown on these pages can be obtained from: 1. Foto Murals of California, 8401 Wilshire Blvd., Beverly Hills, Calif.; 2. Reelway Products Co., 214 Phoenix Bldg., Minneapolis; 3. House of Ideas, 1309 State St., Racine, Wis.; 4. Outdoor Chef Products Co., 180 N. Wabash Ave., Chicago 1; 5. Niagara Instrument Corp., 58 Market St., Lockport, N.Y.; 6. Sybella Products, Wapping, Conn.; 7. Squeezeflo Valve Div., Roth Rubber Co., 75 E. Wacker Drive, Chicago 1; 8. Empire Lion Sales Co., 1550 46th St., Brooklyn 19, N.Y.



# Gus Seizes at a

*"Our rabbits are thirsty," the little girl said. "They haven't had any water all day."*





# Straw

**The youngsters watched anxiously. Could the Model Garageman put enough pressure on a balky pickup to get it over the hill?**

**By Martin Bunn**

GUS WILSON, proprietor of the Model Garage, came across the stalled pickup on a steep grade on the Cedar Creek route. A blazing summer sun beat down on a startling variety of household goods. Gus, halting his truck behind the pickup, noted a hutch of white rabbits resting on the open tailgate and, inside, several baskets of what appeared to be food, a couple of rolled-up tents, fishing poles, folding chairs, a folding table, and odds and ends of camping gear.

A tall, spare man uncoiled from the shade of the truck to peer uncertainly at Gus.

"I'm Gus Wilson," the Model Garage owner announced. "A passing car told me that you needed a mechanic."

"She won't pull the grade," the man said, his voice holding a note of complete discouragement. "The kids have been looking forward to this camping trip out on Eagle Lake for weeks, but at this rate I don't know if we're ever going to get there. It seems like it takes a mechanic to get us over every stiff grade the last hundred miles."

"I see," Gus said.

"If that's the mechanic," a woman called from the cab, "don't you hold him up with jawing at him, Henry Morgan."

Deciding that he was up against a routine case of gas starvation, Gus blew out the gas line, checked the tank for fuel, inspected the fuel pump and carburetor-float setting. He cleaned the carburetor and filter screen, made sure that the gasket of the ceramic filter unit wasn't sucking air, blew out the carburetor jets, inspected the windshield-wiper vacuum line for leaks and tightened the intake manifold. Then, to make certain that he wasn't scouting the wrong track, he ran a routine ignition check. After that, he started the motor, moved around to look into the exhaust pipe. The whitish color of the inside of the pipe convinced him of good compression and clean firing.

Turning, Gus found himself looking into the eyes of a half-circle of children, ranging from about three to 10 years old. They stood there, silent and big-eyed, three overalled and cowlicked boys and a tiny, honey-haired girl.

"Our rabbits are thirsty," the little girl said. "They haven't had any water all day."

"Don't bother the mechanic, children," Mrs. Morgan in-





interrupted as she stepped from the cab, a buxom, motherly woman, the strain of worry and heat on her pleasant features.

"No bother, lady," Gus told her, his eyes moving to where the rabbits lay, sides heaving in tortured breathing.

"There're some shade trees over the hill," he told Morgan. "Let's try to pull over. I'll drive right behind you."

**T**HE pickup started off with a surge of power. It was about a mile to the top of the Cedar Creek grade and the pickup almost made it before it faltered to a stop and the engine died.

"Made quite a piece," Morgan remarked, avoiding Gus's eyes.

The children descended from the car to swarm around Gus.

"You didn't fix it," the little girl declared accusingly, her eyes straying to the rabbit hutch.

Gus smiled down at her, touched her hair with his hand.

"Why don't you kids get some water from that tank in my service car for your rabbits," he said. "There's a canvas there, too. Put it over the hutch for shade."

Their eyes lit up as they ran toward the service car.

"We're country people," Mrs. Morgan said quietly. "Our kids sort of take to animals."

"I know," Gus told her. He tightened all fuel-line connections, removed the ceramic filter unit and replaced it with a new one. Water and other foreign elements sometimes clogged these units.

"Let's try it again," he told Morgan.

When the motor started, Gus saw the pulsations of the pump instantly fill the glass bowl of the filter element. Then, with the children all aboard, the truck pulled to the top of the grade, where Morgan parked on the shoulder.

"Seems to be all right now," he said. "I'll pay you and we'll be on our way."

Gus cocked an ear to the nicely idling motor, eyes wary.

"Let's get this straight," he said. "You've been calling in mechanics every time you hit a steep grade for the last hundred miles. They always get you rolling over the grades but the trouble occurs again. That doesn't sound right to me—there's something screwy here."

"Seems that way," Morgan said. "You're the fifth man we've had work on this rig. They all seemed to think that they had us fixed up for good. We always hoped that they were right. They weren't."

"Any mechanic worth his salt," Gus said, "would spot this as gas trouble the

minute he laid eyes on it. Any mechanic would undoubtedly do the same things I did, and someone has put on a new gas pump recently. What has me puzzled is why these fellows, including myself, got your load over a steep grade if they didn't fix whatever was wrong.

Now if you'll pull down into the shade of those trees, I'll take another look."

It was hot, and as Gus walked back to his service car he found himself hungering for a cold, thick, malted milk, so thick that when you tried to suck it up with a straw, the straw flattened and you had to use a spoon. Gus smacked his lips and drove beneath the trees.

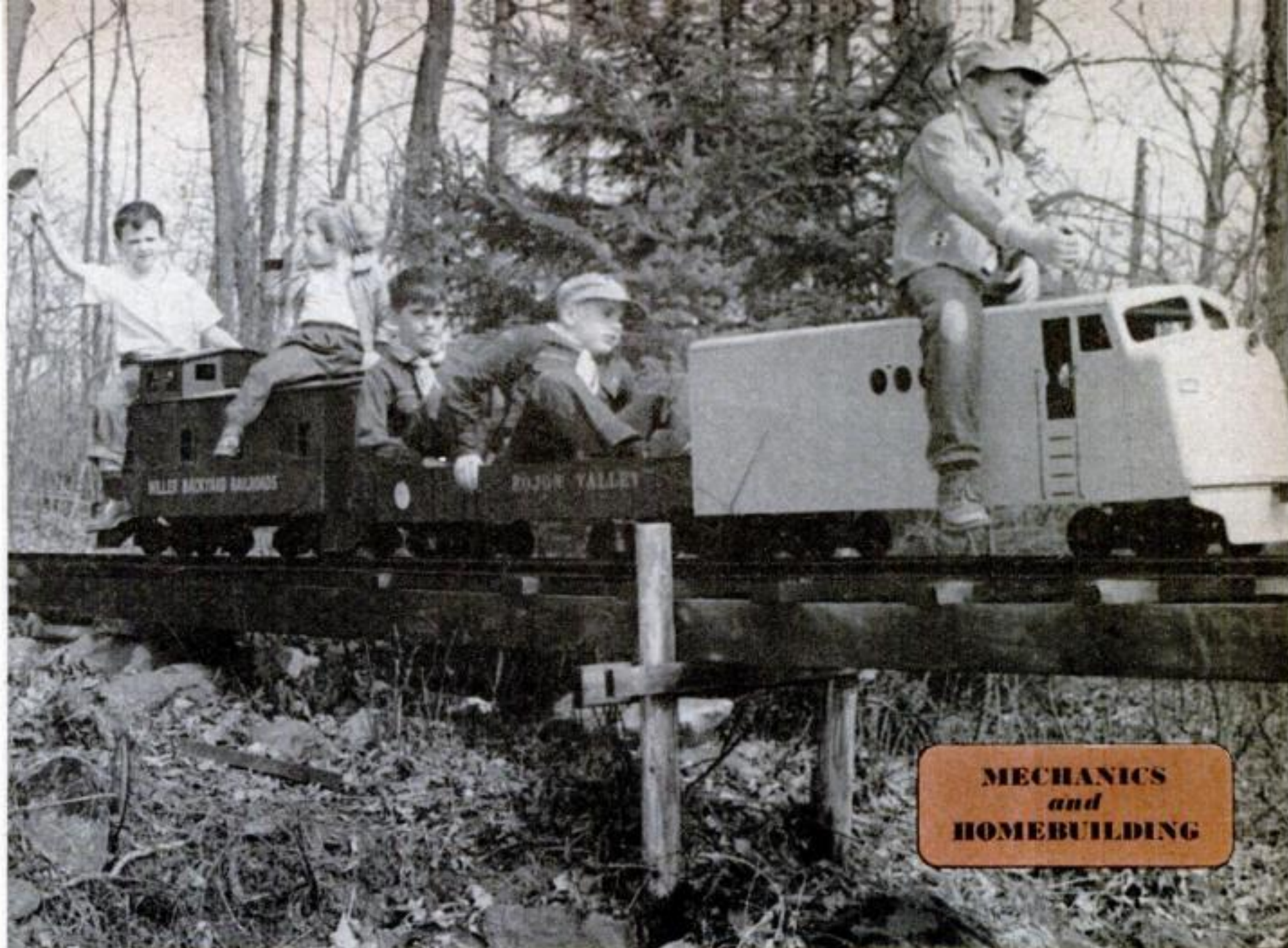
He approached the job now with an air of fresh determination. Under the watchful eyes of the children Gus cut the valve stem out of an old inner tube, together with a portion of the surrounding rubber. He removed the gas-tank cap, placed the opening of the bottom of the valve over the tank filler pipe and wound the balance of the rubber tightly about the pipe, tying it securely. He then attached a tire pump to the valve stem and had Morgan pump vigorously as he crawled about under the pickup.

[Continued on page 210]



"Now see here, Madam!"





# How to Run a Railroad in Your Own Back Yard

***Scaled down to fit your plot and pocketbook, but big enough to carry grownups, midget trains offer fun for the whole family.***

**By Harry Walton**

**G**IVE the kids a train they can ride, and you'll share in the fun. Backyard railroading is a man-sized hobby for all the family. Once you handle the throttle of a midget engine and feel the thrust of drivers on rails, ordinary model railroading becomes a spectator sport.

A passenger-carrying pike costs less than you may think. It can give you scope for as much or as little time and skill as you care to invest. Like its tin-

plate cousins, it can grow up along with the children from year to year.

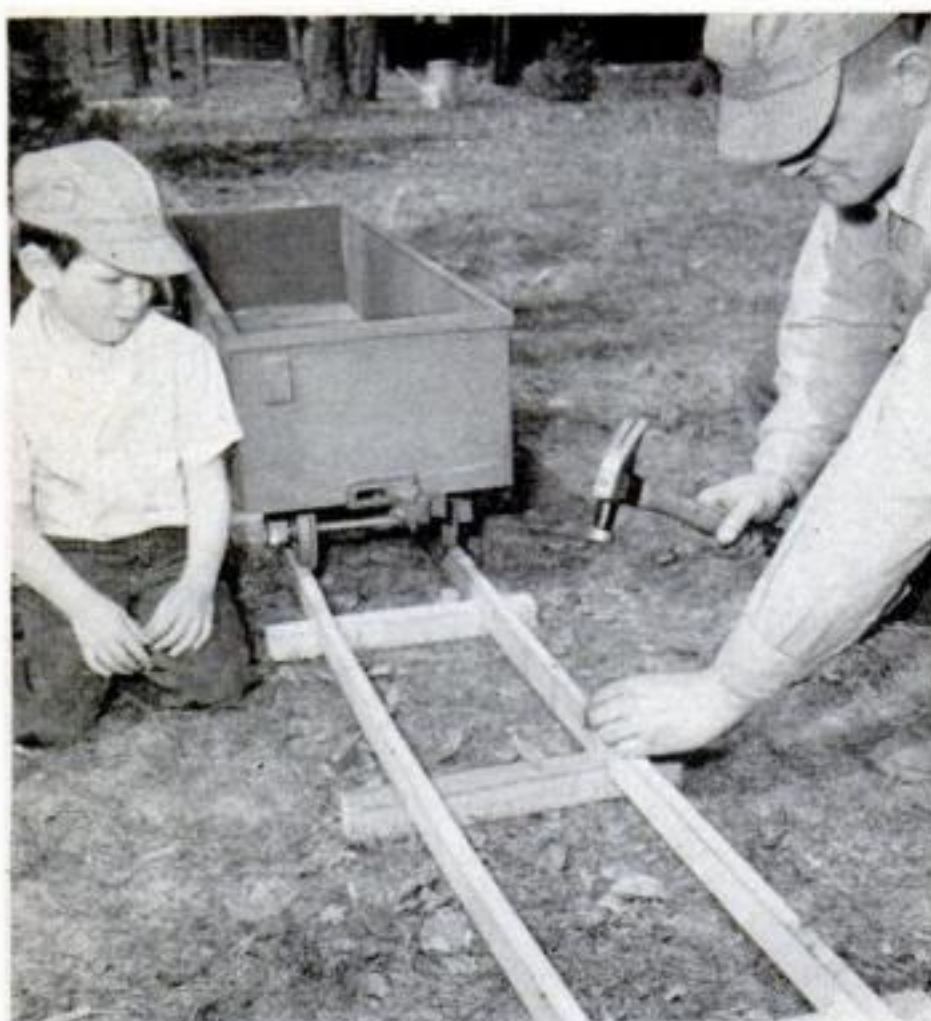
You don't need a big lot. One type of track can be laid in a circle as small as 12' across. Interesting layouts can be put on a city lot. Here's what it takes:

- A reasonably level space, preferably at least 30' by 40'.
- As much cash as a modest electric-train layout would cost.
- Ordinary garden and hand tools.
- One or more children so that you can claim that you're doing it for *them*.

***What will it cost?*** For as little as \$20



## Either wood or metal rail can start you on the right track



**FURRING-STRIP RAIL** is easy to lay in notched ties 1' apart. Toenail it in with 6d. galvanized finishing nails. Creosote the ties for longer life. Fill hollows in ground to provide a solid roadbed. For curves, set one rail into ties 1' apart, bend and hold it to the radius wanted (12' is about the smallest possible) and then bend and press the other rail in place.



**T-SECTION DURAL RAIL** is the real thing scaled down. With aluminum ties, it forms sections as above. These can be laid or taken up like toy-train track. Metal straps (fishplates) are bolted across the joints. Dural rail can also be bought by the foot and spiked to creosoted wooden ties with roofing nails. The best roadbed for ties is a 2" layer of gravel or cinders.

to \$40 you can put down track and get a car rolling on it. The youngsters will enjoy pushing each other around on the car or coasting down an incline. The diesel streamliner, bridges and other trimmings can be added as you see fit.

You have a choice of using cash or ingenuity for many of these improvements. Gas or electric locomotives can be bought all ready to highball. Or you can buy only the parts you can't machine, and build your own engine with nothing but hand tools. If you can machine some parts from castings, the cost will be less.

**Which gauge is best?** Live-steam enthusiasts barrel along behind cinder-spitting little engines on 3½" track. Amusement-park roads run up to 15" gauge. For home use, 7½" gauge is a good compromise; it's big enough for even grownups to ride comfortably, and the cost is reasonable. Here is what you can use to lay 7½" track:

**Prefab strap rail.** For \$40, you get a package deal: a 12' circle of knocked-

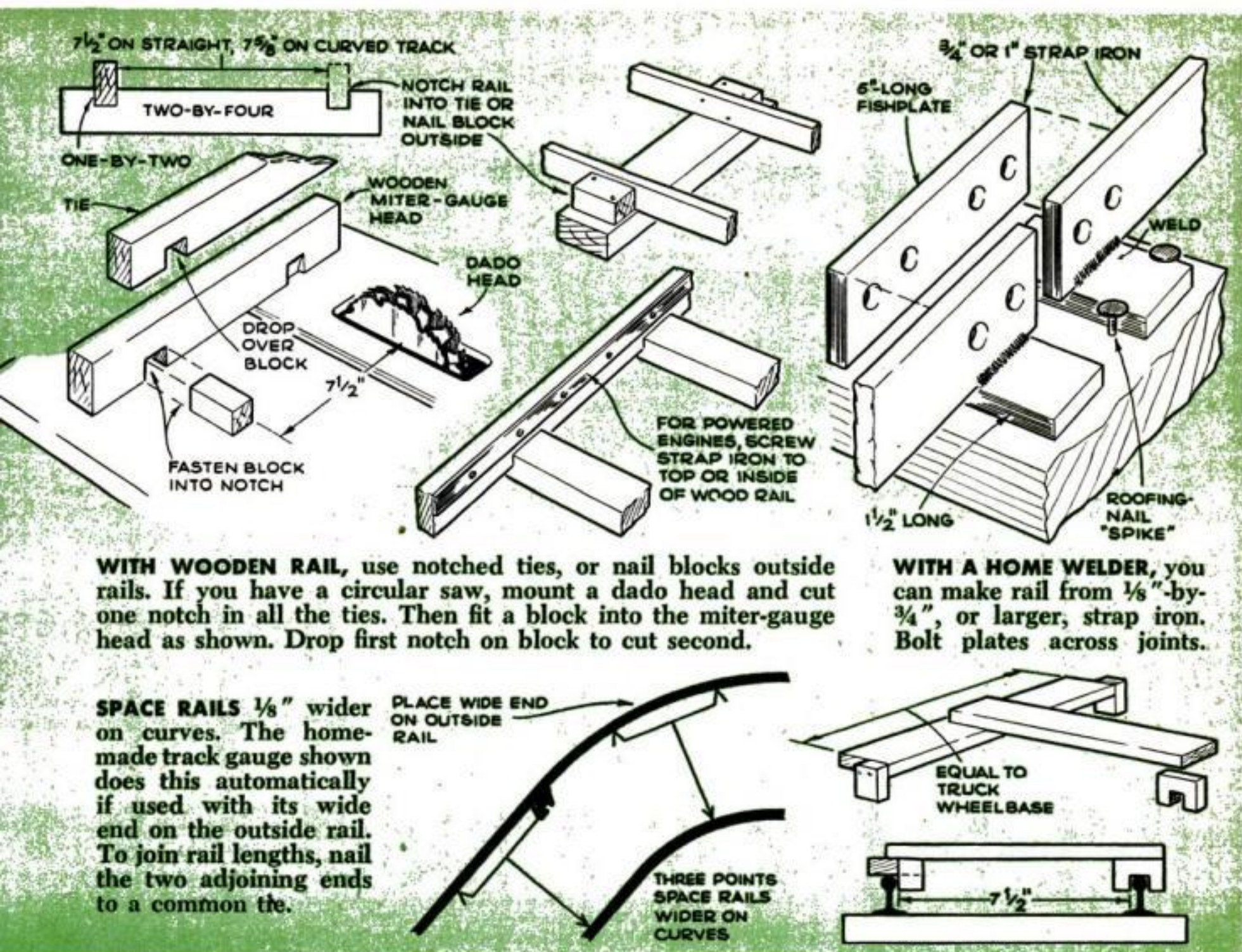
down strap-iron rail and a hand-cranked car. This is light enough for tots to propel, yet husky enough to convert to power later. Various accessories, including power locomotives are available for this track.

**Dural scale rail.** De luxe track can be made with this, spiked to wooden ties and joined with fishplates. It's light and rustproof but comes to 25 cents a foot in 100' lots, plus shipping costs. Even so, you can lay 50' of track, build a car from an unmachined truck kit (which you can machine on a drill press) and still stay inside a \$50 budget.

**Wooden rail.** For much less money, you can lay one-by-two furring strips on ties cut from two-by-fours. Five dollars will buy new lumber for about 40' of track, and secondhand wood, if available,

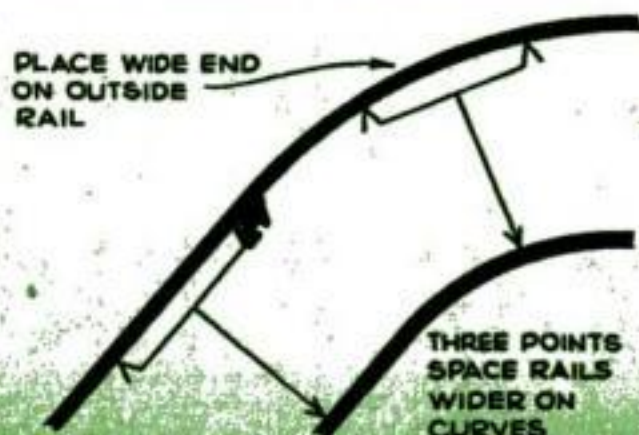
*Handcar, trailer car, strap-iron rail, switches, crossovers, and the two \$225 ready-to-run locomotives are offered by The Charles William Doepke Mfg. Co., Inc., Rossmoyne, Ohio. Dural scale rail, castings for trucks and couplers, switcher chassis, locomotive drive and body parts, and castings for steam-type engines are available from Robert E. Miller, R.D. 1, Box 175, Bath, Pa.*



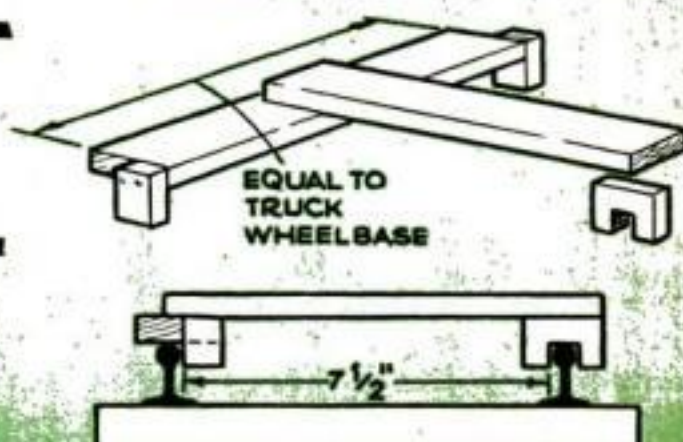


**WITH WOODEN RAIL**, use notched ties, or nail blocks outside rails. If you have a circular saw, mount a dado head and cut one notch in all the ties. Then fit a block into the miter-gauge head as shown. Drop first notch on block to cut second.

**SPACE RAILS**  $\frac{1}{8}$ " wider on curves. The home-made track gauge shown does this automatically if used with its wide end on the outside rail. To join rail lengths, nail the two adjoining ends to a common tie.



**WITH A HOME WELDER**, you can make rail from  $\frac{1}{8}$ "-by- $\frac{3}{4}$ ", or larger, strap iron. Bolt plates across joints.



## Easily finished kit of castings makes car trucks and couplers



**DRILLING HOLES** for  $\frac{1}{2}$ " axles and a few pins is all it takes to finish these castings. The 47-lb. casting set makes two car trucks, two working knuckle couplers and a brake wheel.



**ASSEMBLED** like the finished truck above, these units can be mounted on a plywood floor to make any kind of car. Fitted with sprockets or pulleys, they may be used in a locomotive.



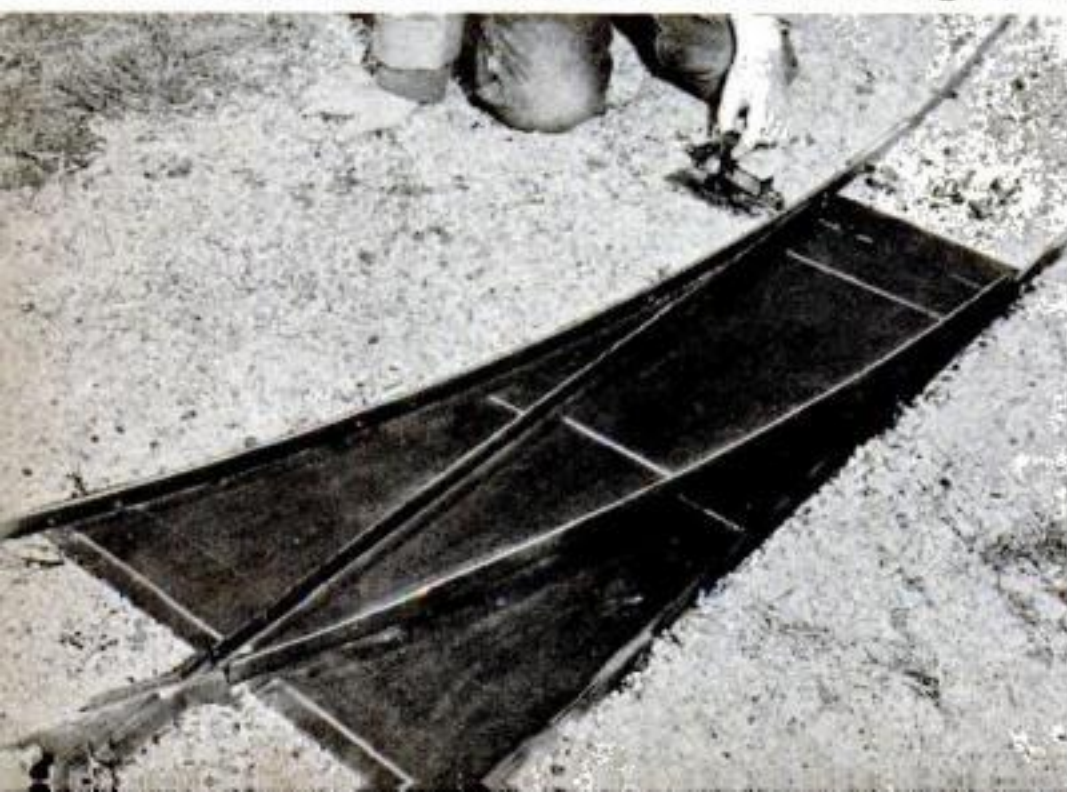


**This play pike can grow into a fully equipped midget railroad**



**WOOD TIES COME SLOTTED** and strap-iron rails predrilled for wire clips. These are bent as shown to assemble the track in either straight or curved form. Extra track runs \$19 for 40'.

**SWITCH OR TURNOUT** comes right hand or left. It is spring-loaded so that wheels running into an open switch can trail through the points. Switches are \$15 each and the crossings \$10.



**A CIRCLE OF TRACK** 12' in diameter plus the hand-cranked car above costs about \$40. The trailer car is \$16. The power locomotives on the facing page can be run on the same track.

will halve even this very modest cost.

Unpowered cars will roll nicely on wooden track, but powered wheels may tend to climb the soft edge corner. You can lick this by shoeing the rails with strap iron when you have a locomotive.

**Other rail.** With a small welder, you can make low-cost rail out of strap iron by welding on foot plates, spacing them like ties. Track has also been made of angle iron, pipe, and conduit.

**How about rolling stock?** You have several choices, from buying ready-made cars to building your own. You can, for instance:

- Buy a trailer car to ride on the pre-fab strap rail. Price is \$16.
- Get a casting kit to make realistic 1½"-scale car trucks. Mount these on a plywood floor, and you have a play push car that can later be converted into a caboose, box, tank or cattle car. Unfinished castings (they need only holes drilled in them) cost \$15; ready to assemble, the kit is \$22.50.
- Buy castings for the wheels only, and make the truck sides and bolsters



## ***Riding behind a real powered midget locomotive is the greatest fun of all***

out of steel plate, angle iron or hardwood.

**Motive power.** This is the most thrilling part of railroading, and you're limited only by your budget at one end or your ingenuity at the other. There's plenty of room in between.

For upwards of \$200 you can buy a gas or electric engine ready to run.

A switch-engine chassis, fitted with electric drive, can be had for \$150. You build the body yourself. By adding a trailer unit later, you can convert this into a super streamliner.

Machined power trucks, transmission and clutch assemblies, cast body parts, and so forth are available individually or as package deals. You can buy what you cannot make or improvise yourself.

The little handcar made for strap rail could be powered with a lawn-mower engine or a battery and auto starter. If the power plant leaves no room to ride, the engineer can perch on a trailer car.

One of the car trucks described (page 149) can be fitted with sprockets or pulleys for locomotive use. A centrifugal clutch or a belt-tightening arrangement, plus one or more jackshafts, will gear down a gas engine to drive it.

**Battery power.** Ford starter motors are widely used for electric drive. A battery charge gives several hours' run because the motor is cut in only at intervals, while the locomotive coasts between boosts. A home charger is, of course, a must. Electric power is popular because children can safely operate it unsupervised. Starter solenoids, controlled by a spring-toggle switch that snaps to off if not held, carry the heavy motor current.

If you go for steam locomotives, you can buy 8" driving wheels, side rods and other parts in the form of castings, but be prepared to machine them yourself. Realistic steam-type engines have been whacked up from food cans, sheet metal and hardboard. If you're really on the ball, you can find a way to synchronize sound and smoke with the drivers.



**ELECTRIC-POWERED "DIESEL"** made for use on strap-rail comes ready to roll. It has two forward and two reverse speeds. A trickle charger is provided to boost the 6-volt auto battery from the house circuit overnight. Both this and the gas-powered locomotive below are equipped with an electric horn and headlight.



**A FOUR-CYCLE TWIN** powers this gas-driven locomotive. The throttle is spring-tensioned to snap shut when not held, providing a "dead-man" control for safety. Priced at \$225 each, both engines above have bodies made of pressed steel and fiber-glass, finished in red and silver.

**ON A POWER CHASSIS,** you can mount a body of your own choice and construction. Plywood, tin cans, rod and tubing, and even parts from old toys can add up to a realistic engine. **END**





# New Troweling Machines Help



“THE trouble with troweling,” one joker has said, “is that it comes after cement work.” That gag is out of date now. The next time you pour a patio or garage floor, you can rent a machine trowel to do that tough job of smoothing—quickly and without sweat.

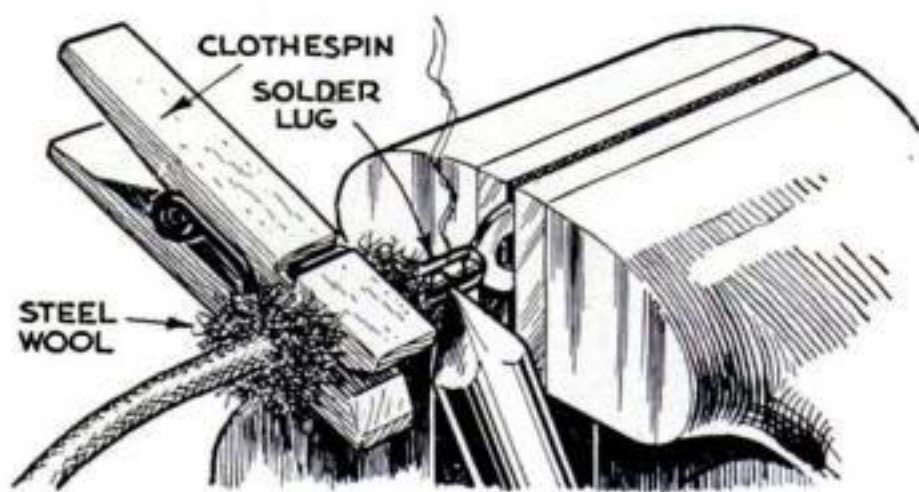
Contractors have had similar machines for years. But new miniature versions, just right for home jobs, can now be rented from distributors in most parts of the country. Cost: about \$8 per day.

The machine trowel looks like a power lawn mower. The one shown here, made by Stow Manufacturing Co., 400 State St., Binghamton, N. Y., has three blades, adjustable for pitch, a



## Filing Resurfaces Hammer Head

MANY a blow of an old hammer glances off a nail because its surface is no longer smooth. You can easily restore the even surface by working on the face with a file.—George E. Mattis, Birchwood, Wis.



## Steel Wool Protects Insulation

LUGS on electric wires should be soldered close to the insulation. You won't run the risk of burning the insulation if you wrap it first with steel wool to absorb the heat. Hold the wool in place with a clothespin. Don't use this method with an open flame—the wool will ignite.—Hugh Lineback, Stillwater, Okla.



# Do-It-Yourself Cement Workers

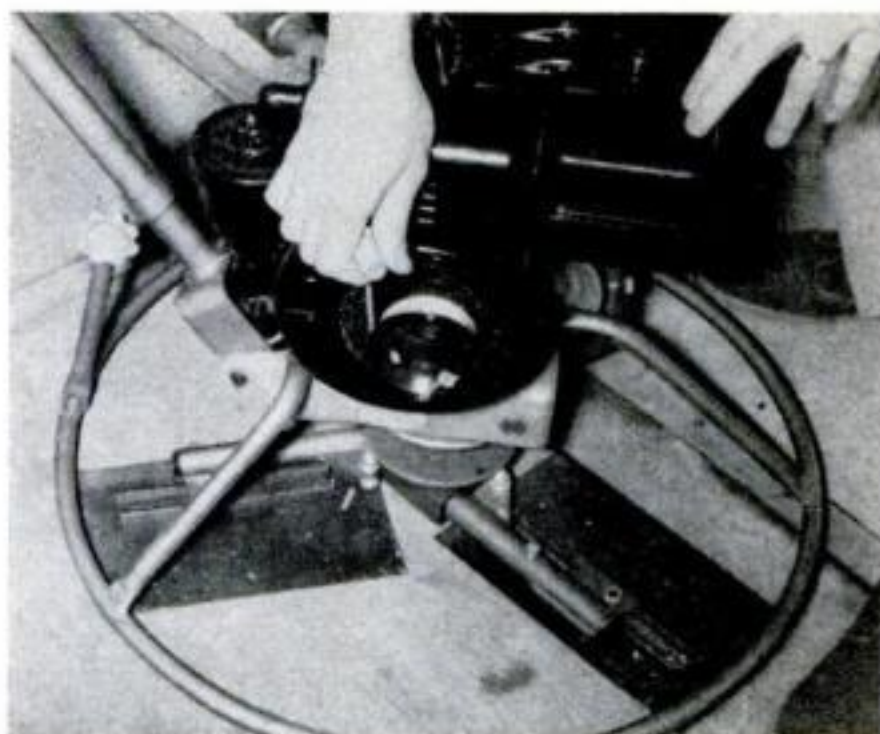
one-lung gas engine and handle-bar controls. You can cart it home from the dealer's and back in the trunk of your car.

To use it, you start the engine, adjust the blade pitch, set the handle to make it move in the direction you want, and engage the clutch. It's a good idea to practice, the first time, with a dry run on the sidewalk to see how it is operated to run forward, backward and to either side.

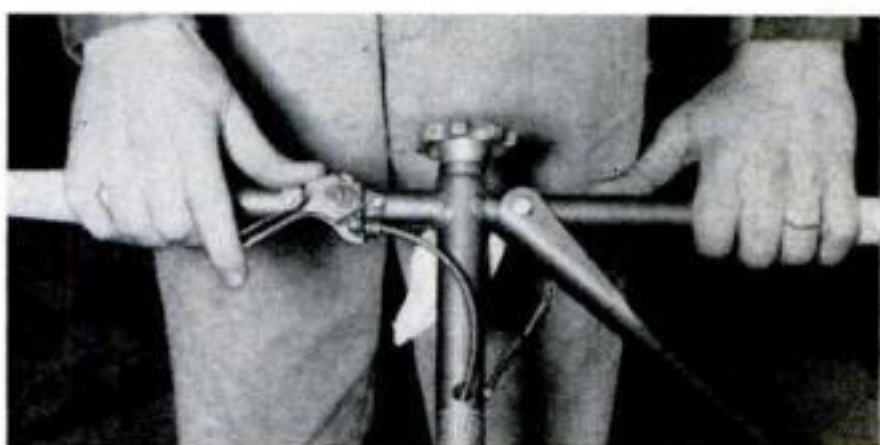
If you use a stiff concrete mixture—what the pros call a 1" slump—you can begin troweling within an hour after you have leveled the slab with a strike board. The surface should have set enough so that you can walk on it without making a noticeable impression (wear sneakers).

Go over the slab first with the blades set flat and revolving slowly. Finish by cautiously increasing the blade pitch until the surface is as smooth as you want it. You should be able to leave the slab so slick that no hand floating is necessary, except in corners that the machine cannot be made to reach.

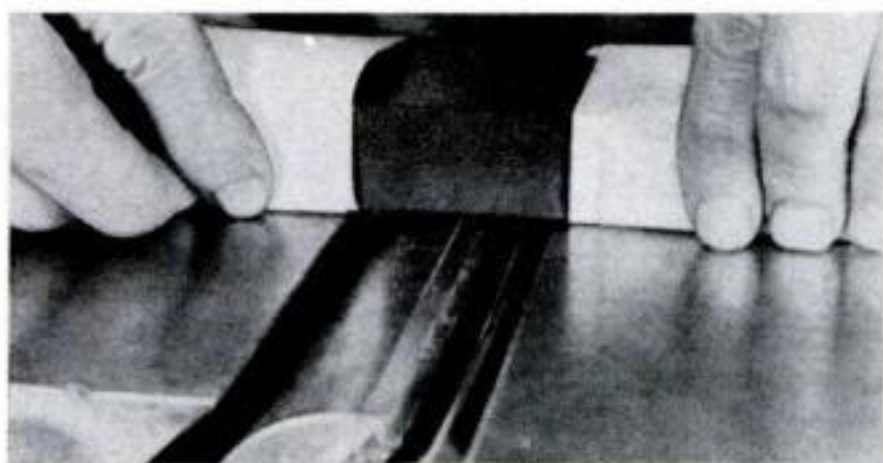
When you're through, don't forget to take the trowel off the slab and wash it clean immediately. It's tough to scrape off concrete that has set.—*Jerry Parker.*



**LIKE A LAWN MOWER**, the machine trowel has a rope-started one-lung engine. Three replaceable blades, each 6" by 10", can be adjusted to a top pitch of  $\frac{1}{4}$ ". Speed: 35 to 130 r.p.m.

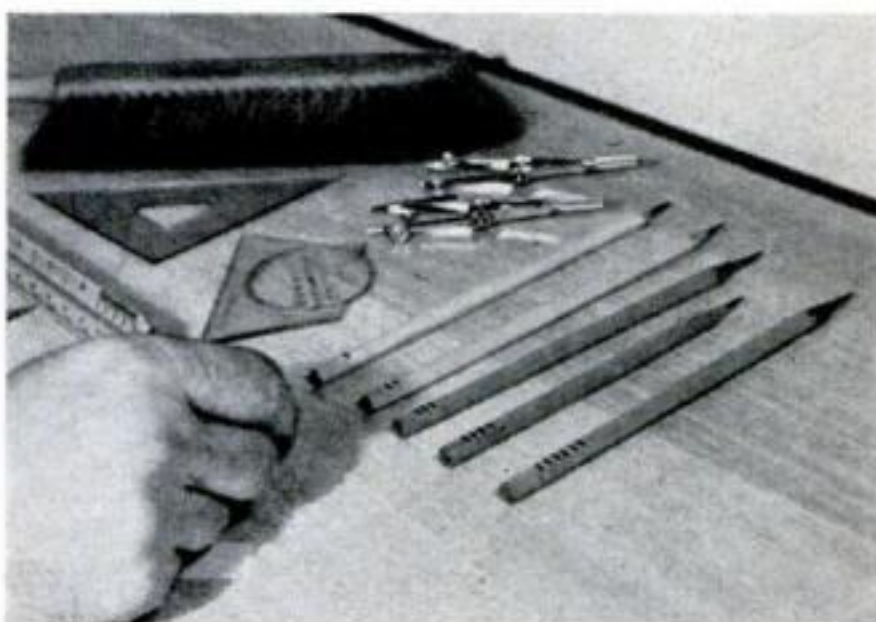


**CONTROLS ARE ON HANDLE:** throttle (left), pitch adjustment (center), clutch (right). To move left, raise handle; right, lower it; forward, twist clockwise; backward, counterclockwise.



## Oilstone Hones Jointer Cutters

You won't have to remove your jointer cutters for grinding so often if you hone the blades occasionally with an oilstone. Hold the cutter head so that the oilstone touches only a cutting edge. With the ends of the stone wrapped in paper to protect the surface of the table, pass it along each edge 15 or 20 times.

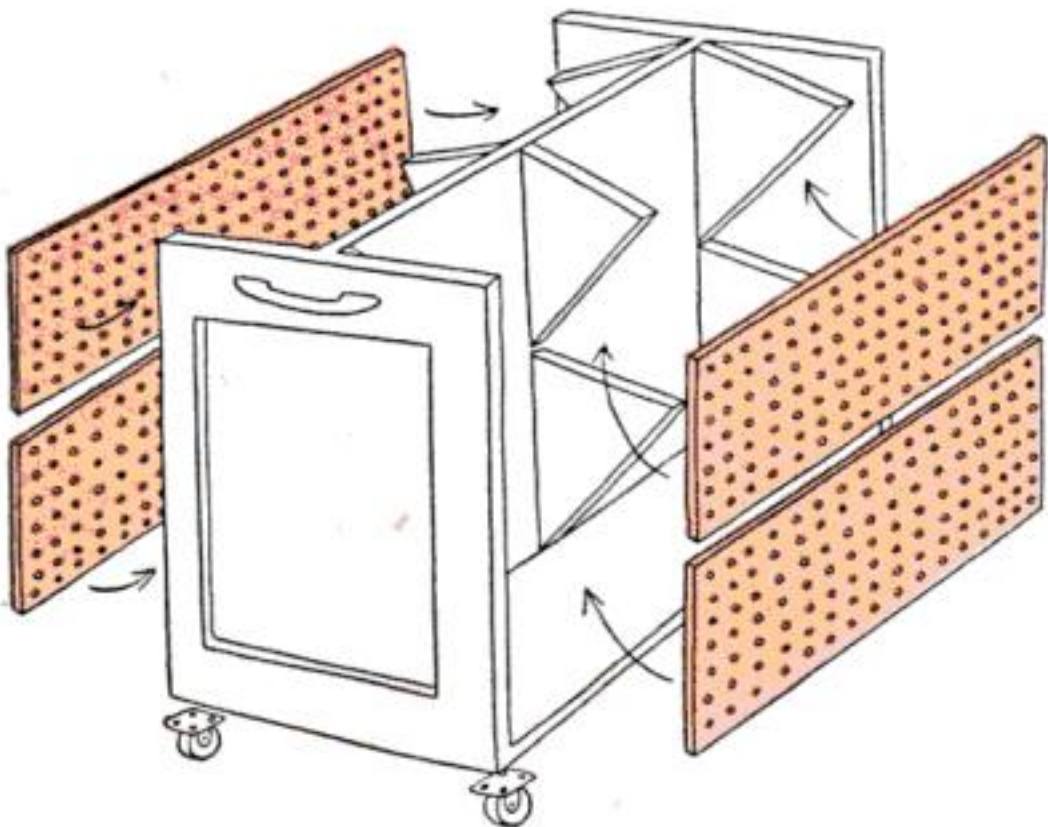
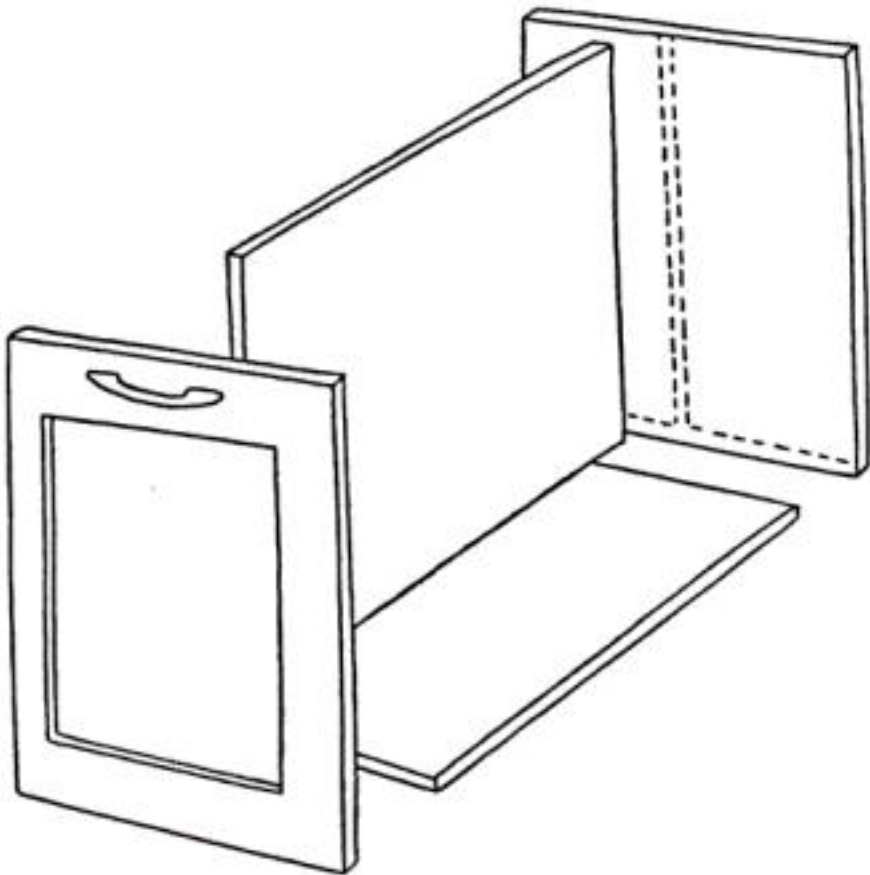


## Notches Help You Pick Pencil

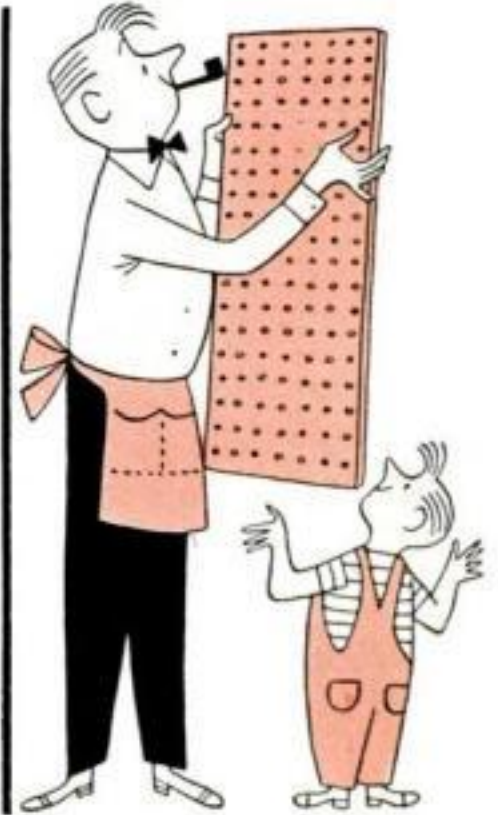
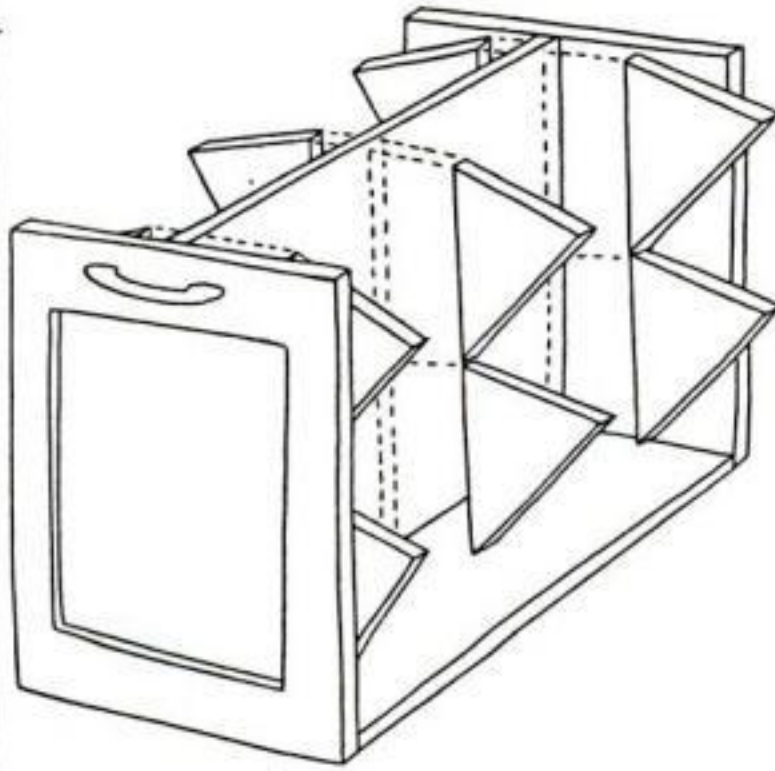
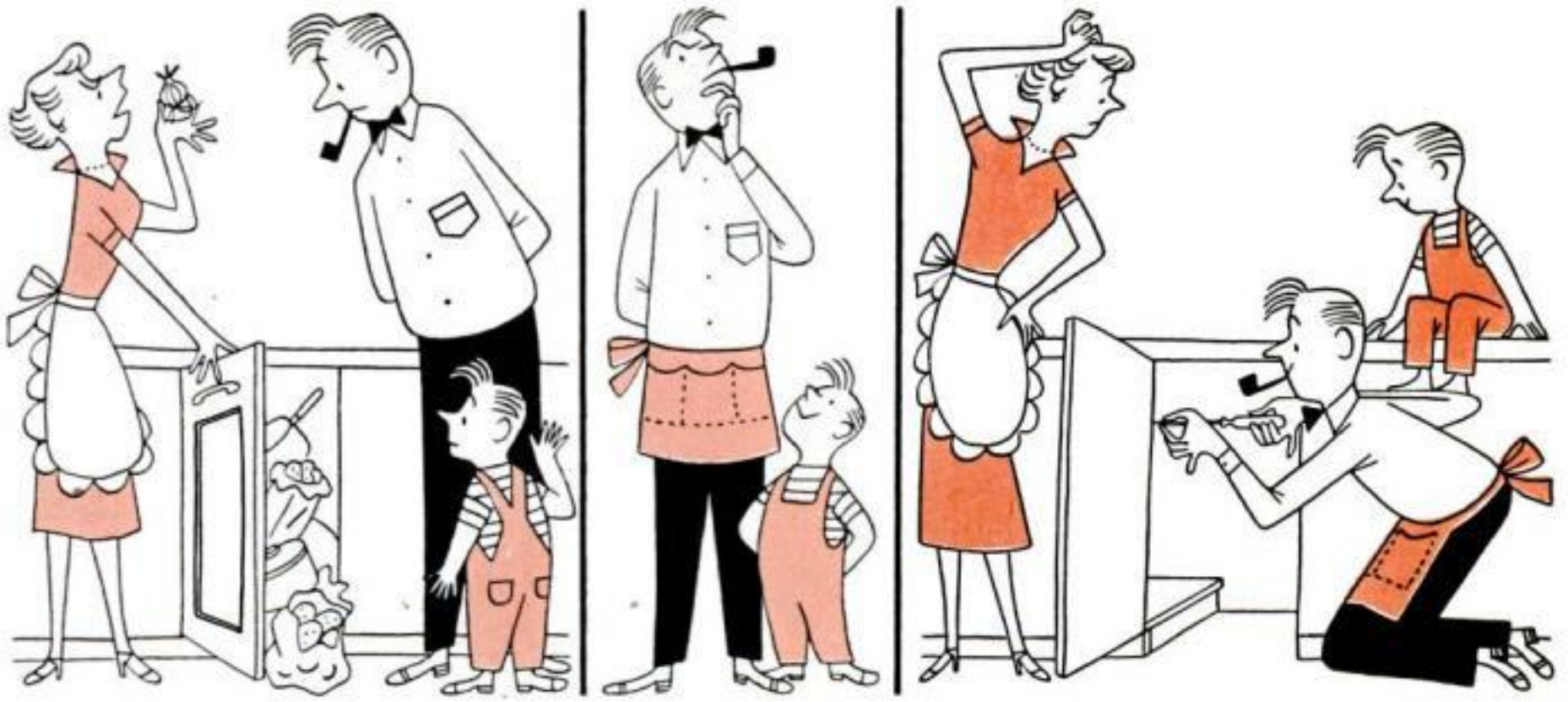
THE right drafting pencil is easy to pick out if you mark your collection with notches for degree of hardness. Ink the notches to make them stand out.—*Michael Ligocki, Gary, Ind.*



# Wordless Workshop







**Next Month: A tip-proof, easy-to-roll holder for a garbage pail**



# How to Make Your Garage

**A**LL it takes to make the old garage look new is "a little initiative and a goading wife," jokingly reports Joseph Gannon of Glendale, Calif.

It took Gannon, a school principal, only 20 years to get around to doing something constructive about the clutter of furniture, tools and supplies that shared his garage with the family car. "Shared" isn't quite the word. The car was grudgingly admitted under the same roof with the other treasures.

The Gannons live in a house that has neither attic nor basement. Where else can you store things, Joe used to ask, but in the garage? Grace granted him that there was no other feasible place, but she still felt there was no excuse for not making it *look* presentable.

In one of those mysterious bursts of inspiration and accomplishment that dazzle even the doer, Joe Gannon in three weekends obligingly fulfilled the wish that his wife had been making every spring for 20 years. It cost him 12 hours' effort and about 35 bucks.

**Time.** Here is the job breakdown:

Building four simple shelves.....	1 hour
Assembling small workbench.....	½ hour
Hanging tool board and mounting most-used hand tools on it.....	½ hour
Sanding and painting old chest..	1 hour
Nailing strips of one-by-four to the back wall, installing and painting cup screws to hold tools, laundry cart, aluminum yard chairs, etc.....	1 hour
Painting the shelves and the entire garage interior .....	8 hours

**Cost.** Here's what he spent:

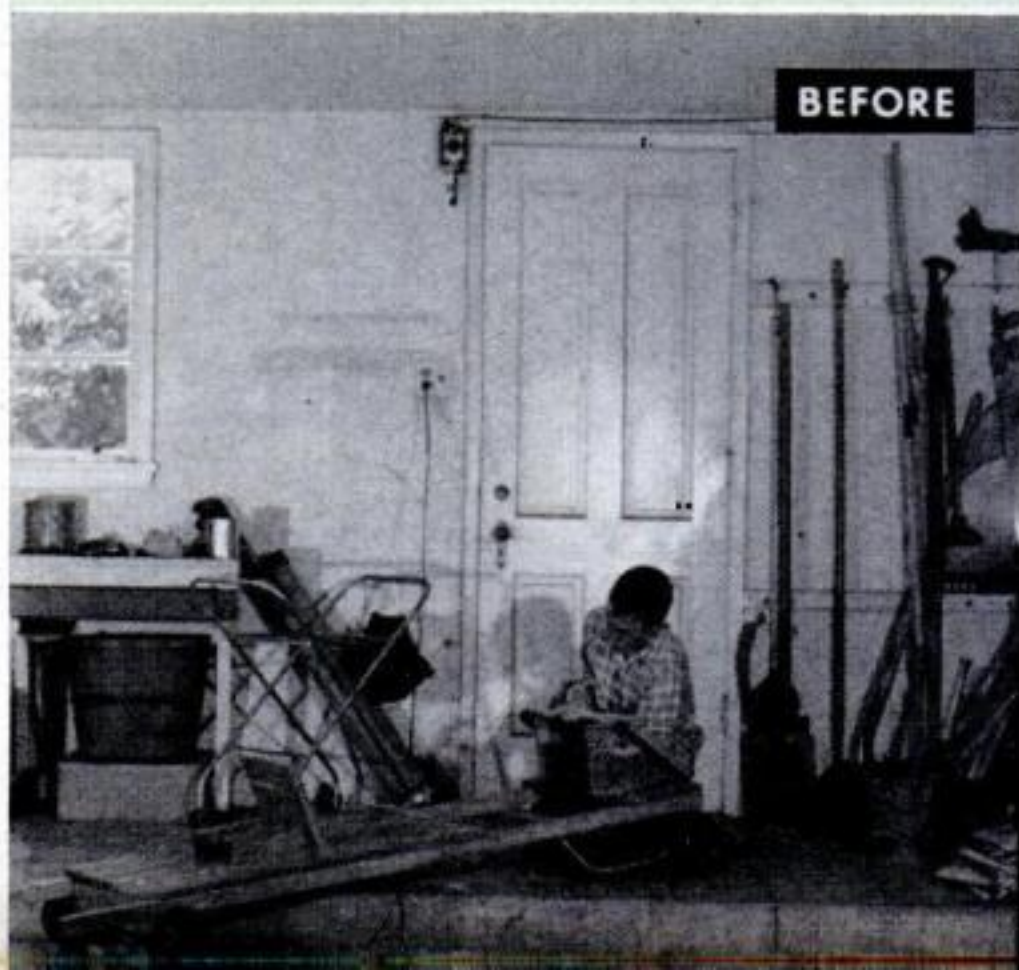
One gallon of paint.....	\$ 6.00
Tool board.....	.85
Aluminum hooks for tool board..	1.00
Disassembled workbench.....	26.00
Lumber .....	2.00

The accompanying photos show you the problems Joe Gannon faced and how he solved them. Simple, wasn't it?



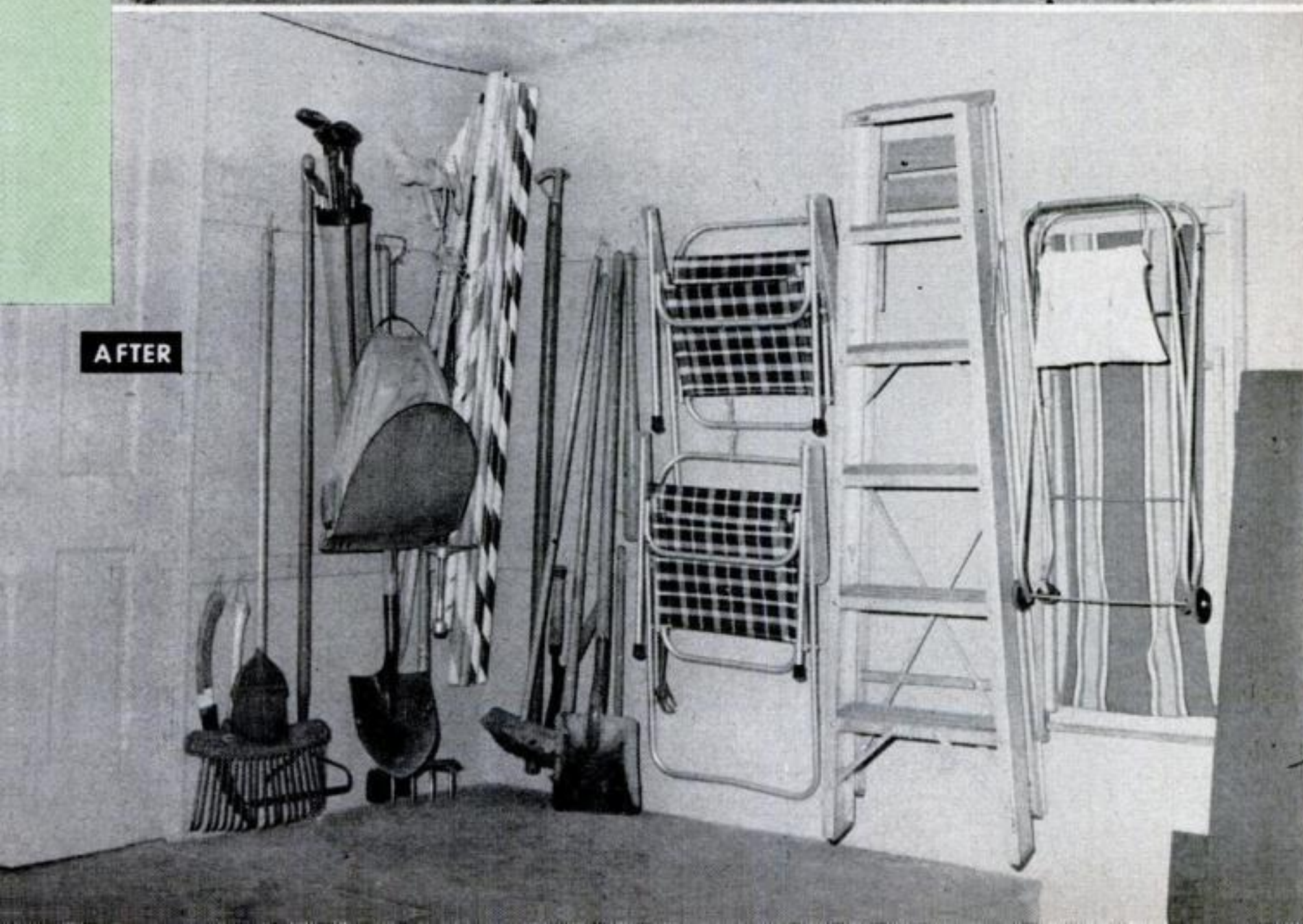
**BOB'S ROCKS AND SHELLS**—one cherished collection among many—are still kept in the drawers of the old chest. But the chest has been neatly repainted, the chaos of miscellaneous chairs, baskets and odd parts cleaned up. Now four 17"-by-34½" shelves hold paints and supplies. There is a new workbench, and a board on the wall for small tools. Two big popcorn cans on the chest of drawers provide caches for Bob's arrows and extra tools.

**ACROSS THE BACK WALL** (right), additional strips of one-by-four make hang-up room for a wide assortment of items from a grass-catcher to a laundry cart. Before "operation cleanup," this part of the garage (below) held many of the same things jumbled together—plus a collection of old newspapers. When the car was in, Bob barely had space for that scooter.





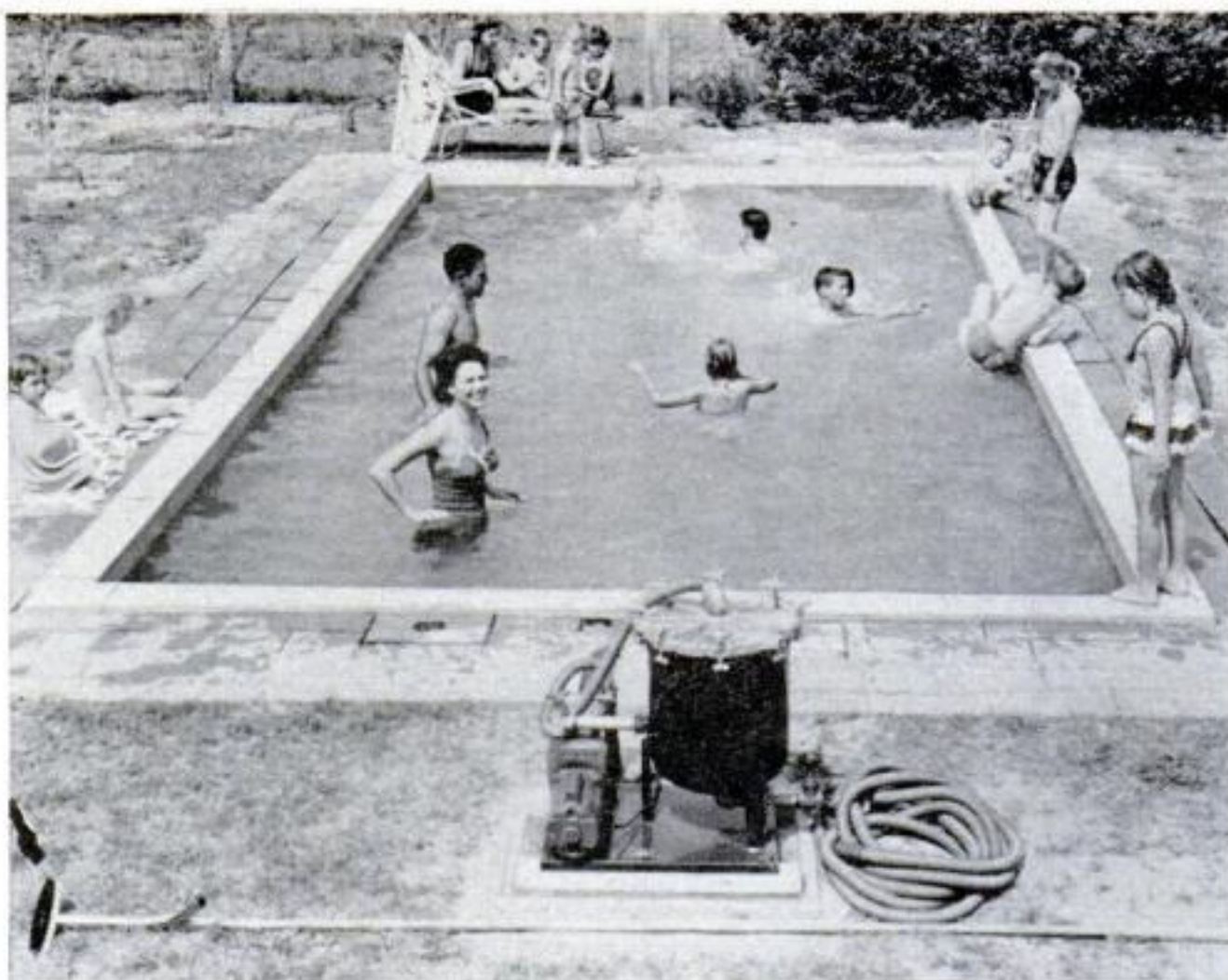
# Please Your Wife





# Pool Kit Filters Water, Too

**PLASTIC-LINED POOL**, at right, is good for years of trouble-free use, says manufacturer. Its high-capacity filter and circulator keeps one filling of water clean for an entire season.



**APPROXIMATELY 48 CUBIC YARDS OF EARTH** must be removed for the pool excavation. The bottom of the hole is then tamped firm for the sloping floor of the plastic liner.

**YOU** can now buy a Hollywood-size swimming pool in a do-it-yourself kit. It includes everything but the muscles for the excavation, and material to reinforce the side walls. You get a tough vinyl plastic liner that measures 12' by 27', varying in depth from 3' to 5', coping strips to hold the liner in place and to dress up the edges of the pool, a pump and filter to clean and recirculate the water, a skimming box to catch surface debris, and a suction cleaner to remove dirt from the pool sides and bottom.

The kit shown, from Sears, Roebuck, costs about \$900. Similar ones are offered by local home-supply dealers.



**POOL SIDES ARE REINFORCED** with concrete blocks (400 8"-by-8"-by-16" blocks and 14 half-blocks). The blocks and mortar are not part of the kit, must be bought separately.



**PLASTIC LINER** goes over tamped earth bottom, is then covered with 5" of sand for protection. The liner overlaps tops of wood-capped side-walls. Fiber-glass strips clamp it on.





# The Right Way to Use Roll Roofing

***Cheap and easy to handle, it can be made to last a long time—and look good, too—if you follow these tips from the pros.***

**By William B. Eagan**

**Y**OU can put down roll roofing faster and more cheaply than any other kind. And it's not just for chicken coops, either. By following the methods that the pros use, you can turn this inexpensive material into a trim-looking, durable roof that will last many years.

Roll roofing is also the only type that the average amateur can install himself on roofs that are too flat for shingles. For small structures such as garages, porches and carports, you can't beat it.

**Choose the right type.** Roll roofing is an asphalt-saturated felt that comes in long strips, usually 36" wide. It's made in one-, two- and three-ply thicknesses, with either a plain or slated surface. The slated type is a bit more expensive, but has a more pleasing appearance and will last a little longer.

The thinner types are for two-to-three-year use and must usually be cemented in place with liquid asphalt. The thicker types will stand up for many years and

do not ordinarily require cementing except at the seams, where a special lap cement is used.

Roll roofing is also sold according to the minimum roof pitch that it can safely be used on. Most types work well on a rise of 3" to the foot, but a few require 4" or 5".

**Flat roofs.** Only a professionally applied built-up roof can give complete protection on very shallow or dead-flat roofs. However, roll roofing is often used on such roofs if minor leaks are not a serious problem—over carports and porches, for example.

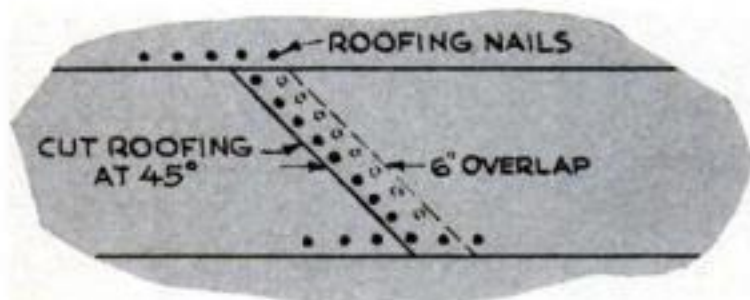
One special roll roofing, called half-lap, is recommended for these shallow roofs. It is laid with each strip lapped halfway over the preceding strip, providing double coverage. Well-laid half-lap is raintight on roofs that are pitched as little as 1", but it is less safe on flatter types of roofs.

**Use short lengths.** Despite the temptation, you can't just unwind roll roofing and nail it down. Long strips that run the length of the roof will expand and



then buckle under the heat of the sun.

Use strips 10' to 12' long, and stagger the end joints so that they don't line up with those in adjoining rows. Cut joints at a 45° angle to shed water.



Before you lay down the new roofing, coat the old surface with asphalt paint and let it dry. This makes a better bond for the new roof.

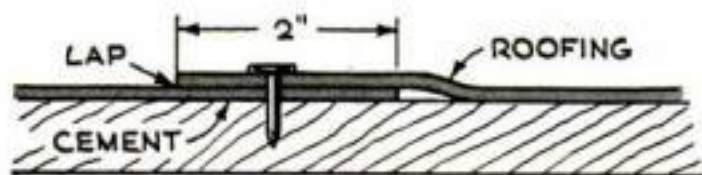
If the old roofing has buckled, the new roofing will not lie smoothly over it. Cut the buckles like this and cement



the overlapping flaps down flat. You can help prevent future buckling of the new roofing if you install it in hot weather, after it has had a chance to expand.

**Lapping the edges.** If you don't get the edges down tight, they will pull up and tear in strong winds and driving rains, causing leaks.

For pitched roofs with slopes down to 3" to the foot, you can use a nailed joint. Cement down the lower edge, overlap the top one 2" over it, and nail through both edges like this:



Space the nails 2" apart. They should then be covered over with lap cement to keep water from running in around the heads.

Be sure that you nail carefully along the center of the lap to catch both edges. If you hit the lower piece too close to the edge, it may split and pull away from the nails. If you miss the lower edge completely, the top one will

curl upward, forming a scoop to catch wind and rain like this:

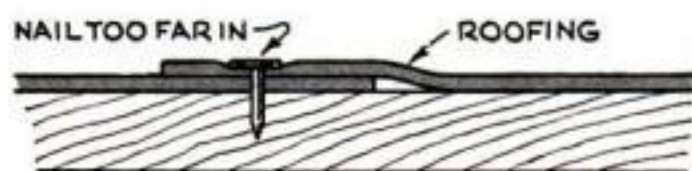


**Keep the nails straight.** What happens when you drive a nail in crooked is shown in this drawing. One side of



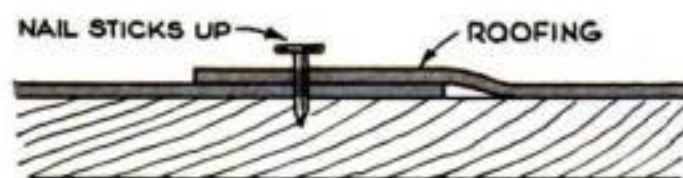
the head leaves a gap for water to seep in, while the other digs into the roof surface. Driving a nail at an angle also enlarges the hole, providing a pathway for water.

If you hammer a nail too far in or hit the head off-center, you get this:



The head cuts into the surface, often deeply enough to cause the roofing to leak or to start tearing away from the nail.

Too little hammering is just as bad as too much. Here the nailhead doesn't meet the roofing surface, and water leaks



in under it. For best results, the nail should press firmly enough against the surface to form a tight seal without cutting into the roofing.

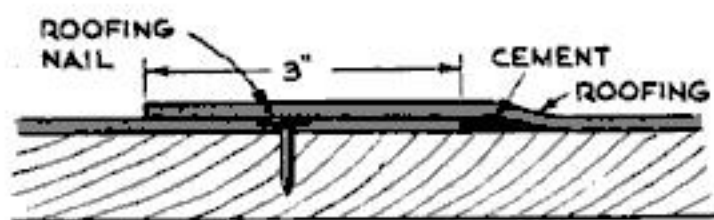
**Spreading the cement.** Often the lap cement is too stiff to pour easily from the can. If that happens, you can do this: Turn the can upside down and slide it along the underside of the roof-



ing. Spread ribbons of cement as wide as the can opening along edges and at ends of each strip.



**Nail-less joints.** By using cemented instead of nailed joints, you can use roofing intended normally for a 3" pitch on 2" slopes—because there are no nail-heads to loosen and let in water. Here only the bottom edge is nailed down, and the top one is cemented over it with a 3" lap—instead of 2"—for greater protection.



Cemented laps require sandbags, steel plates or other weights to hold them down until the cement thoroughly dries. You can make your own sandbag weights from canvas. Stitch up the sides to form slender tubes about 3" in diameter and 2' long. Then tie the ends with drawstrings to hold in the sand.

Half-lap roofing is put down entirely with cement, but is heavy enough not to need weights along the joints. A simple butt joint that does not require weights either is sometimes used on regular roll roofing over an existing roof. (It is not recommended for new roofing over bare sheathing.) Here the edges are brought tightly together and a bead of cement run along the top like this:



After all the strips are in place, the entire surface should be coated with asphalt paint.

**Make a rain drip.** At the sides and ends of the roof, the strips should be carried down slightly below the edge of the sheathing so that rain will run off without working back up under the roofing. If you want to dress up the edge, add a beveled wood strip, painted to match the rest of the trim like this:



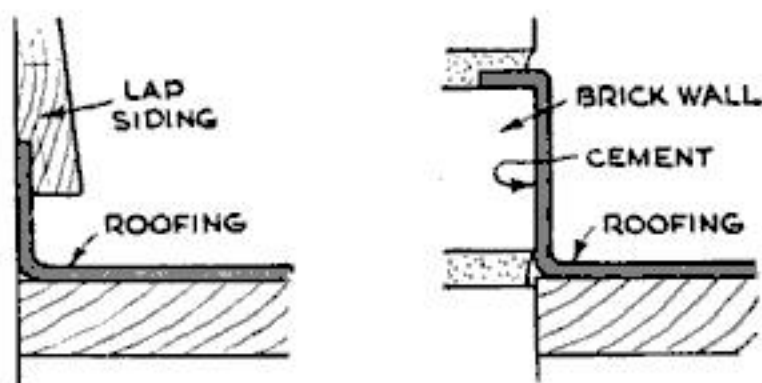
Don't end the roofing at the top of the sheathing or halfway down the edge, as shown in the sketches below, or rain



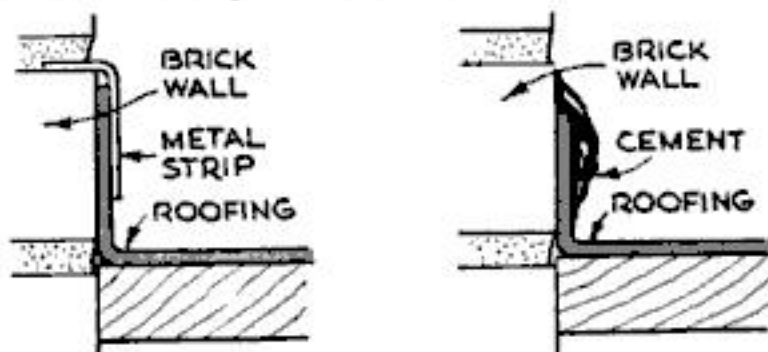
will be driven underneath, causing leaks and wood rot.

**Flashing.** Where you have to attach roll roofing to other parts of the house, it's important to make a watertight joint or one crack may ruin the entire roof.

On shingles or clapboards, you can simply slip the edge of the roofing up under the bottom row. Pry them out carefully, if necessary, then renail them tightly over the roofing edge, as shown at left below.



On brick or masonry walls, chisel a small crack in the mortar and cement the edge of the roofing into this, as shown above at right. If you find it difficult to cut a large enough slot in the masonry, you can slip a thin strip of flashing metal into the crack and bend it down over the edge of the roofing, as at left below. Or you can just carry the roofing up the side of the wall, as at right, and top it off with a bead of cement. It won't look as neat but will be reasonably watertight.



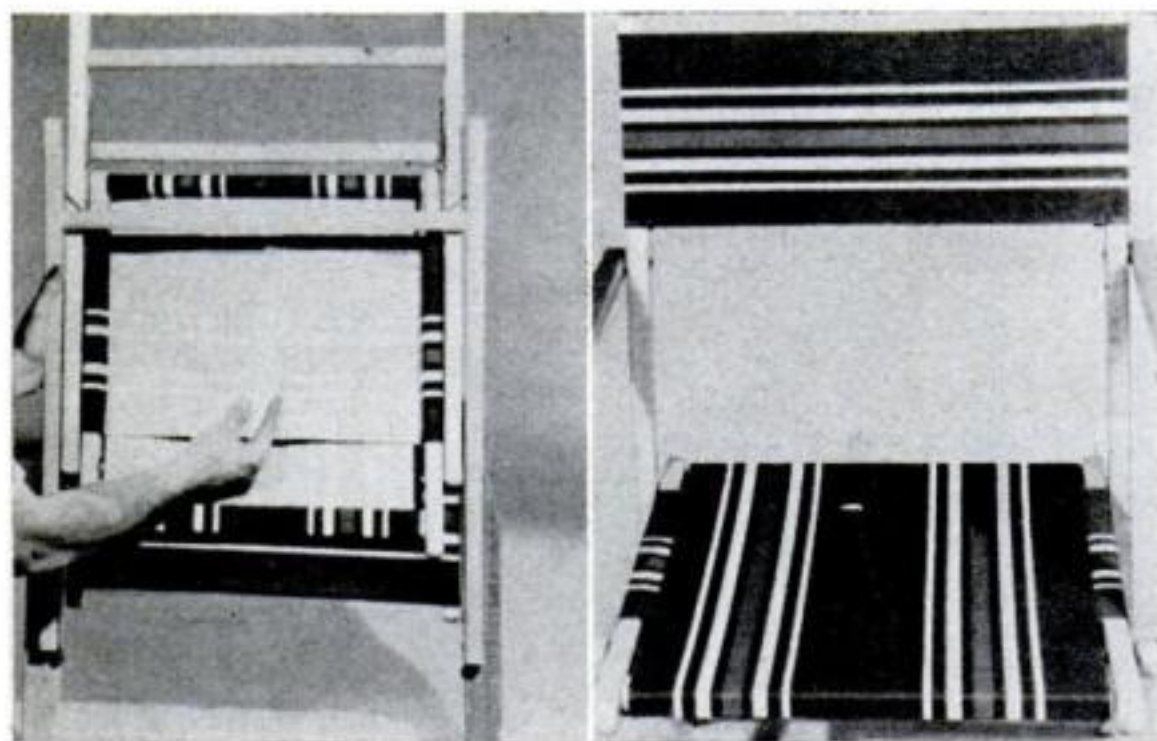
When the roofing is finished, avoid walking on it, especially after it has settled in place. Heavy footsteps may cause the uneven edges of sheathing underneath to cut the underside. **END**



# New for the Handyman

**1. Extension Cord Winds on Reel.** You will be able to use power tools outdoors as far as 300' from a socket with this new cord reel. It carries 300' of No. 16 cord or 200' of No. 14. A plug in the frame connects it with a line from the house.

**More information** about the products on this page can be obtained from: 1. Lakeshore Products, Woodinville, Wash.; 2. Alvin Products, Inc., 20-22 Houghton St., Worcester 4, Mass.; 3. Industrial Instruments, Inc., Cedar Grove, N.J.; 4. M. Kessler Hardware & Mfg. Co., 69-72 78th St., Middle Village, N.Y.



**2. Patch Is Versatile.** Dip this cloth in a special solvent and it sticks to the underside of a lawn-chair seat for an almost invisible repair. The fabric is impregnated with a Bakelite plastic, which is made sticky by the solvent. You can use it to mend broken toys, reinforce luggage seams and cover holes in metal or plaster. It comes in 5"-by-8" pieces.



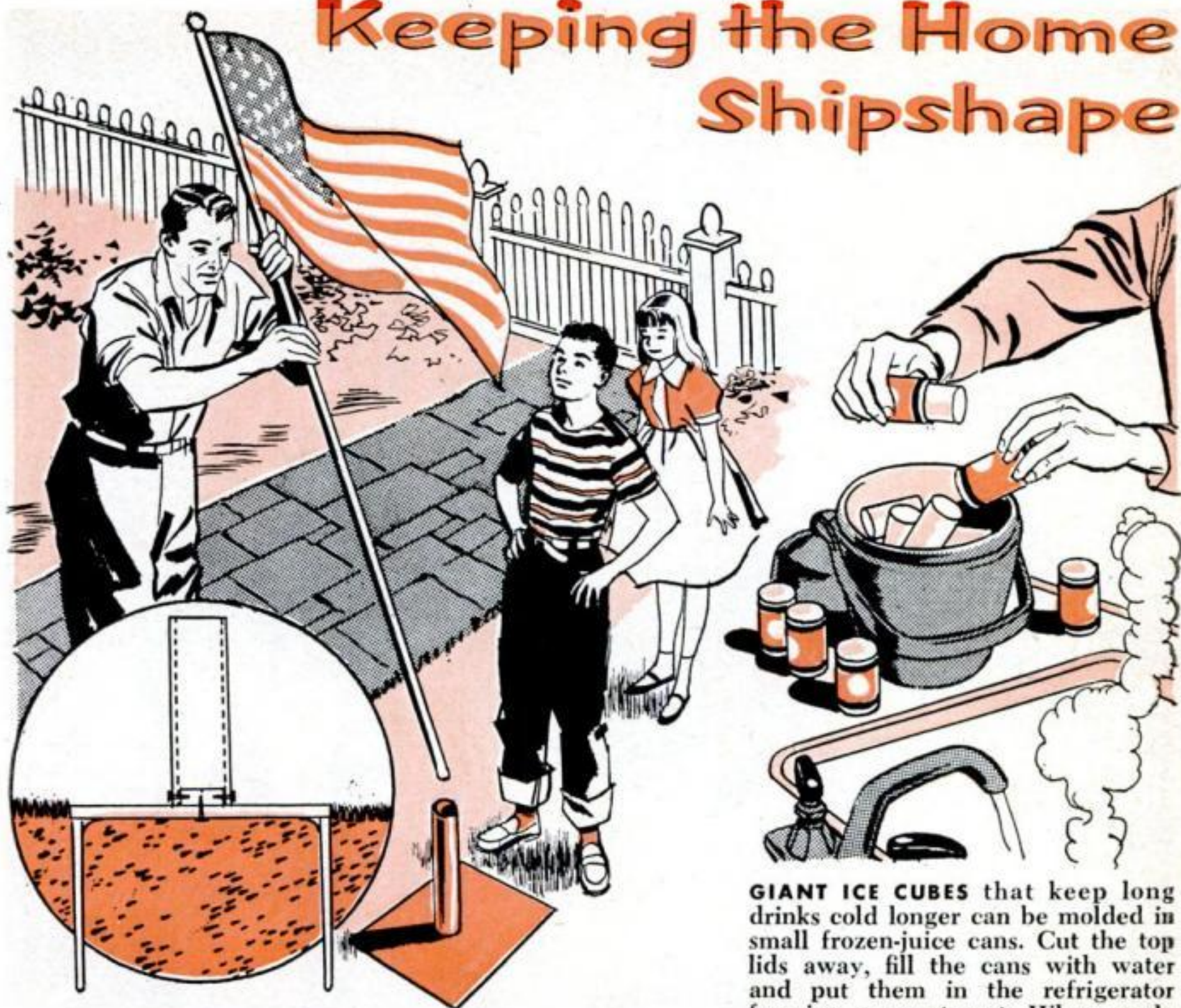
**3. Electronic Pulse Keeps Lawn Moist.** With this meter in your basement, your lawn waters itself. The controller is connected by wire to an indicator buried at root level, and turns the sprinkler on automatically when soil moisture content drops to 10 percent. Another model gives you readings, but isn't automatic: you have to turn the sprinkler on yourself.



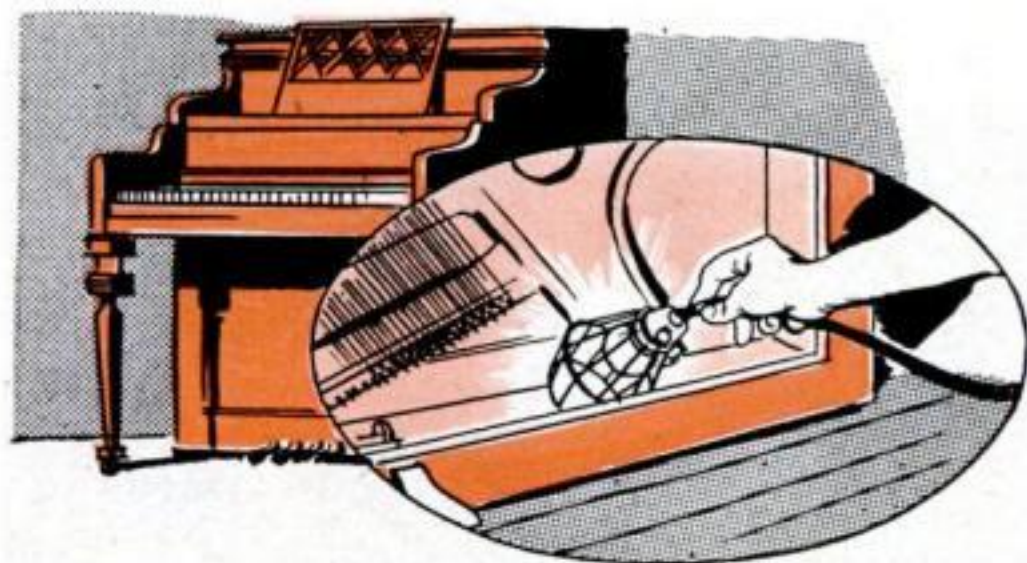
**4. Plastic Tracks Guide Sliding Doors.** You can install sliding doors in a cabinet quickly and easily with these double channels of extruded plastic. Screws or cement fasten them in place. They take  $\frac{1}{4}$ "-thick doors—hardboard, plywood or glass—which slide in the channels without hardware. Slip-on handles made of the same plastic are also available.



# Keeping the Home Shipshape



**A PORTABLE FLAG STAND** for your lawn can be made from a 12" square of exterior plywood and a 9" length of thin-walled tubing that is just big enough for the flagstaff. Fit a wooden disk in the bottom of the tube, holding it with two screws, and screw the disk to the plywood from the underside. Drive spikes through corner holes to anchor the flag stand securely to the ground.



**TO CHASE HUMIDITY** out of a piano and keep it in tune longer, keep a 25-watt bulb burning inside it during damp weather. Enclose the bulb in the wire guard of a trouble light to shield the wood. This same trick can be used to dry out a damp basement closet.



**GIANT ICE CUBES** that keep long drinks cold longer can be molded in small frozen-juice cans. Cut the top lids away, fill the cans with water and put them in the refrigerator freezing compartment. When ready to use, put the cans in the sink and pour hot water over them until the cylinders of ice will slide out easily.



**PARAFFIN SEALS** on homemade jams and jellies are easier to lift off in one piece if cardboard milk-bottle caps with pull-up tabs are set into the wax. The cardboard disk is inserted in the wax before it hardens; then more wax is poured over it. Lift the tab, before putting it in the wax, so that it will form a handy finger grip.



## More Home Tips



**REFLECTOR STRIPS** will show up children's toys left outdoors after dark. Stick a piece of tape on the front, back and both sides of each toy and you won't be so likely to trip over them, or to turn Junior's tricycle or kiddy car into scrap iron when you drive in at night.



**PROTECT AN OPENED COOKBOOK**—or a book of shop plans—by sliding it into one of the transparent bags in which shirts are packed. The plastic sheath prevents stains but leaves the print clearly readable.



**IF YOU CUT YOUR CHILD'S HAIR**, the round dusting-brush attachment on your vacuum cleaner will do a good job of picking up tickly hairs from his neck.



**A LEAKY FAUCET** may stop misbehaving if you reverse the washer until you can go out and buy a new one. The upside-down position turns up a flat surface.

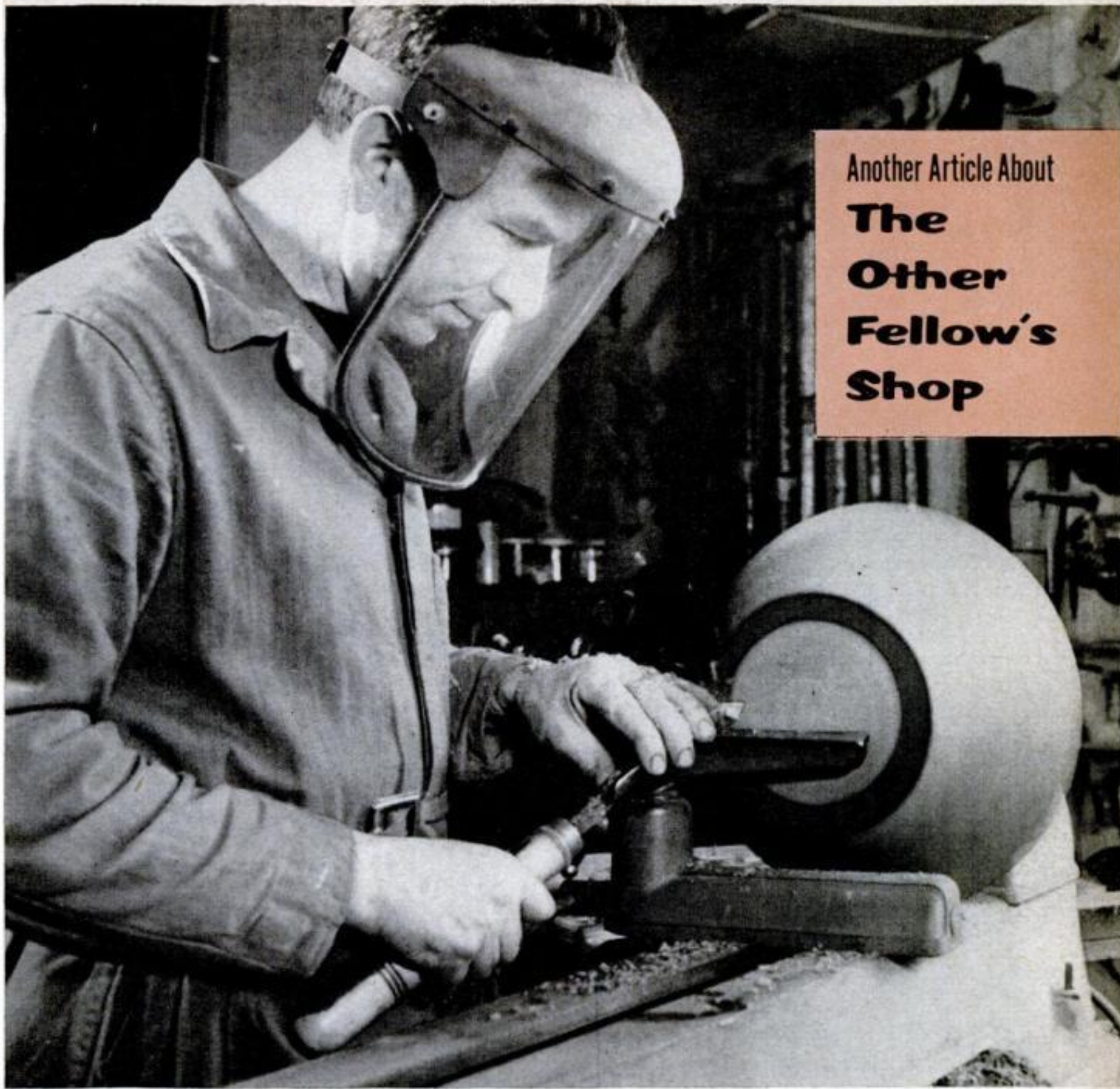


**LET PLANTS WATER THEMSELVES** while you're off on vacation. A wick made from several lengths of soft cotton cord will do the job. Twist the cords together, put one end in a jar of water and loop the other end loosely around the plant.



**BASEMENT WINDOWS** with hinges at top or bottom can be held at any position. Put a barrel bolt on the sash and mark the line it scribes as the window is raised. Bore holes in the frame to engage the bolt. Tubing in the holes adds strength.





Another Article About  
**The  
 Other  
 Fellow's  
 Shop**

# Bowls Are His Business

By **Darrell Huff**

**W**HEN you see a fine-figured, glass-smooth zebrawood bowl in an expensive shop, turn it over and you'll probably read "Bob Stocksedale" on the underside.

Bob is the craftsman whose lathe transforms hunks of rough and unpromising wood small enough to heft between two fingers into high-priced items for some of the country's flossiest specialty counters.

It all started during World War II when, as a conscientious objector, Bob Stocksedale found himself in a camp in California's Feather River Canyon, fighting forest fires and



**HANDSOME WOODS,** plus unusual skill and an eye for good design, have won Bob Stocksedale national recognition for fine lathework.

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**BOWL PRODUCTION BEGINS** with a circle scribed on a Guatemalan mahogany blank selected for its strikingly figured grain. Stocksdale cuts blanks on a bevel to save costly hardwood.

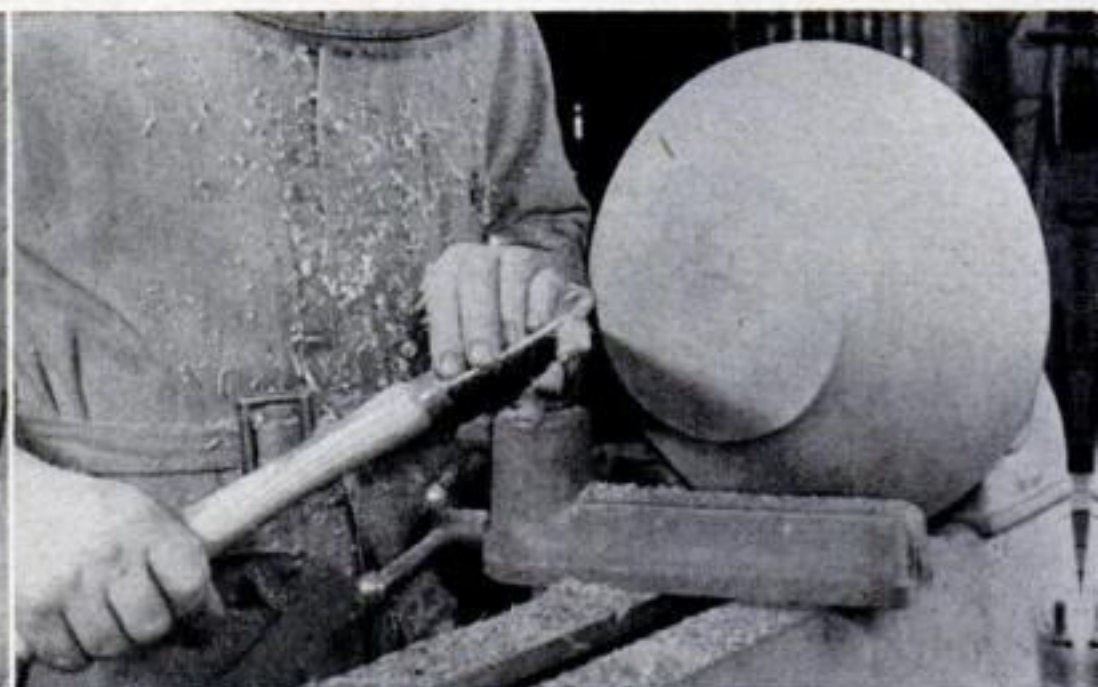


**AFTER THE BLANK IS CUT** to rough contour on a bandsaw, a hole is drilled at the centermark left by the scriber, so that the wood can be threaded onto the lathe's screw center.



**BOB THREADS THE BOWL BLANK** onto a screw centered in a hardwood disk that is bolted to the lathe's faceplate. The disks he is holding are used to chuck his smaller turnings.

**BRINGING OUT BEAUTY OF WOOD** takes sanding—lots of it. Bob uses at least five grades of sandpaper, starting with No. 2 garnet and ending with 6/0. He slows the lathe for sanding.



**BOTTOM AND SIDES** of bowl are roughed out with a 1½" gouge, then smoothed with a 1" gouge. Bob runs the lathe at about 800 r.p.m. "Higher speeds dull tools fast," he explains.

**BEFORE MAKING THE INSIDE CUT**, Bob drills a 1" center hole as deep as the lathework is to go. This gives him a depth guide to work to when the work is rechucked on the lathe.







**FINE SHAVINGS FLY** as Bob makes the rough hollowing cut with a 1½" gouge. The bowl bottom is carefully centered on the lathe faceplate. Note that the tool rest is placed as close

to the turning as possible. He finishes with a ½" gouge, checking wall thickness often with calipers. He interrupts work regularly to grind and hone tools—they must be kept very sharp.

building trails. To fill his few leisure hours, the former Indiana cabinetmaker arranged with camp authorities to have his tools shipped in and made available to all. He began turning wood bowls because it was the kind of work he could pick up or leave at a moment's notice.

**The big break.** After the war, Bob settled in Berkeley, Calif. In the big basement of his home, he resumed his bowl-turning work in earnest. Soon he got the break that established him—a sale to a San Francisco department store famed for its collection of jades, silver and fancy

price tags. Today he has similar outlets in New York, Dallas and Detroit. They keep him as busy as he wants to be, and he generally settles for a 40-hour week.

What makes Bob's plates and bowls distinctive enough to justify prices that run up to \$100 and more for a single decorative piece? Fine contemporary design, expert workmanship and Bob's choice of rare and striking hardwoods.

Bob has outside and inside storage areas, crammed with tons of this stock in rough and blanked-out form. He buys the greater part of it from dealers. The





**SCREW HOLES** where the faceplate was attached to the bowl bottom are enlarged to  $\frac{1}{4}$ " and filled with plugs of matching wood. Bob aligns the plug grain with that of the wood.



**BOWL CARRIES BOB'S SIGNATURE** and name of the material used, scribed on the bottom with a wood-burning pen. A two-day bath in mineral oil gives the bowl a rich, natural finish.

rest he hunts for on field trips in the country north of Berkeley.

**Treating woods.** For green wood—the kind he frequently brings back from his own wood-hunting trips—Bob has two courses of treatment. If the wood works better while green, he gives it a rough shaping on his lathe, then sets the thick-walled disk or bowl out to season. In the process of drying there is always some warpage, but Bob corrects this in the final, thin-walled turning. Other green wood that works better when dry is simply stacked for seasoning after he has brushed the end grain with melted paraffin to keep it from checking.

**Finishing.** Bob's work is divided into two classes: decorative and functional turnings. For his decorative pieces he chooses the most dramatically grained

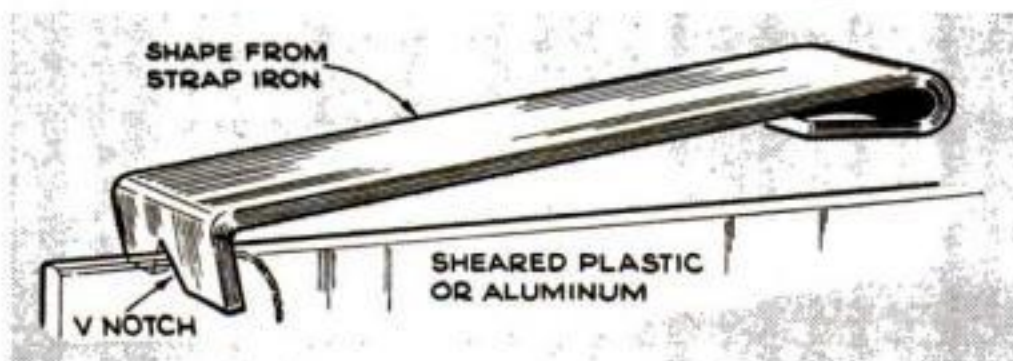
wood, then turns it to almost unbelievable thinness (he once made an experimental bowl so thin that it was translucent). Finally he smooths the pores with wood filler and sprays on two coats of varnish. When the second coat is fully hardened, he runs the piece down with fairly coarse pumice and mineral oil, working with the grain on flat pieces, or with a circular motion on bowls. On oily woods, such as teak, he uses water-white lacquer instead of varnish for a better bond.

Bob doesn't advise a novice to plunge into decorative bowl-turning on a first attempt. Even with his knowledge of wood structure, he goofs occasionally.

"The way to start is with a thicker-walled functional turning," Bob says. The photos show how he does it. **END**

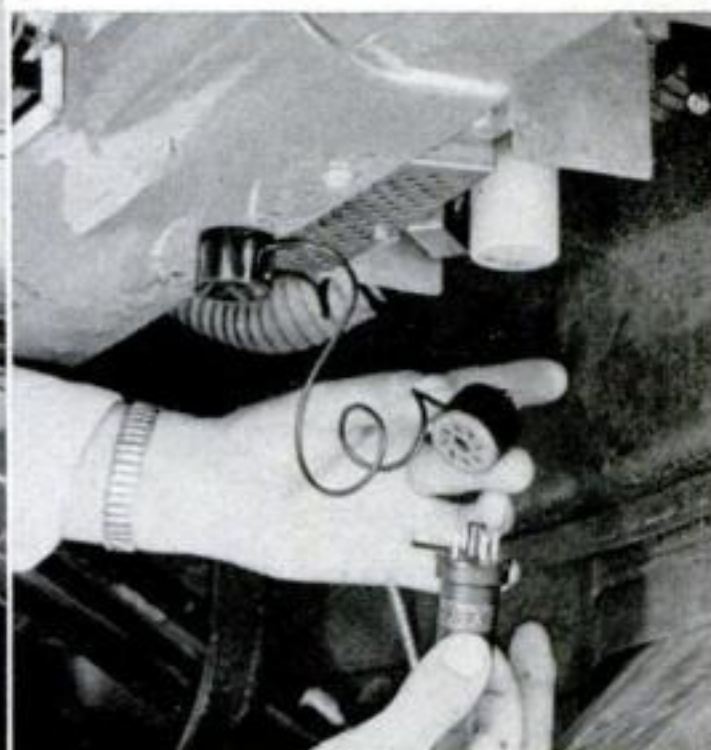
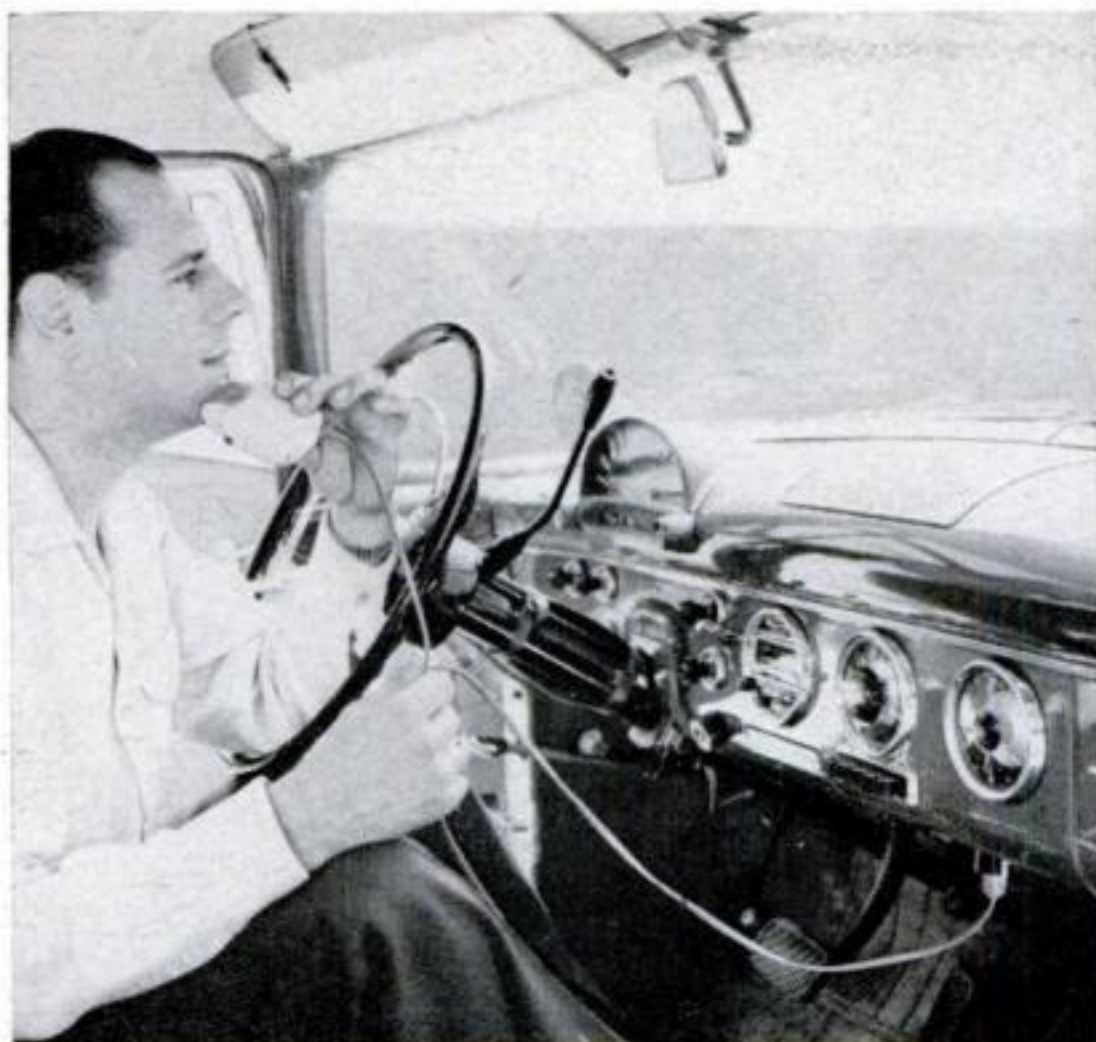
## Homemade Tool with V Notch Deburs Metal and Plastic Edges

A CONVENIENT tool for taking the burr off the edges of sheared plastic and aluminum can be made from a short length of strap iron. Bend as shown, cut the V notch, and sharpen it with a triangular file.—Victor H. Lamoy, Upper Jay, N. Y.





# New for Your Car



## 1. Adapter Runs Shaver on Car Radio.

One way to shave on a vacation trip is to plug your electric razor through this adapter into the rectifier-tube socket of your car radio. The voltage at that point

is right for most shavers. A receptacle is mounted under the dash to connect to the adapter, which is inserted between the tube and its socket. You can play the radio while you are shaving.

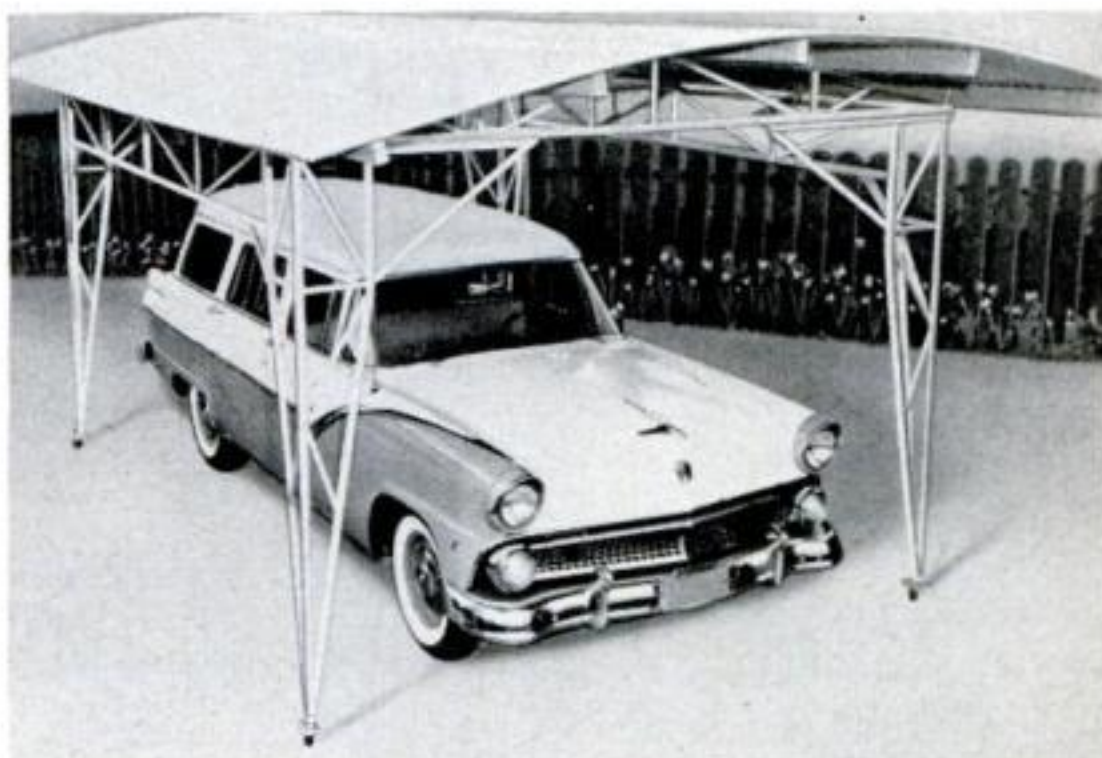


**2. Vent Airs Locked Car.** A gridded vent that is held tight astride the glass of a window will allow air to circulate in your car when you leave it locked on a hot day. You slip the one-piece vent into place and roll the glass up. It can't be removed from the outside of the car.

*More information about the products shown on this page can be obtained from: 1. R.E.N. Mfg. Co., 5803 White Oak Ave., Encino, Calif.; 2. Protecto-Vent Co., 7100 Brompton Rd., Baltimore 7; 3. H. C. Mun Co., 162 Seventh St., Oakland, Calif.*

## 3. Aluminum Carport Roof.

The temperature under the sun-reflecting, curved top of this prefabricated carport is said to be 20° cooler than the air on the outside. You can put it up on its aluminum-sprayed angle-iron frame without using special tools. The unit comes in one- and two-car widths. Its legs, adjustable in height to 8' 6", may be bolted to a cement base or mounted on casters.





**Like to save elbow grease?  
Then you ought to know**

# **The Facts About Power Sanders**

**By Paul Corey**

**W**ITH kilowatts cheaper than elbow grease, nobody has to be a slave to hand sanding these days. There is a battalion of modern electric machines to do every kind of sanding job.

Smoothing surfaces for finishing is only one of the things power sanders will do. They can also help you shape, true, size and even joint work. Some excel at smoothing, others at roughing out stock. Most machines will do both jobs in some degree.

There are four main types—disk, belt,

drum and finishing sanders. If you want a sander you can take to the work, a portable machine is the answer. If the work can be taken to the machine (and is of a size and shape that can be maneuvered on it) a bench-mounted sander will handle it.

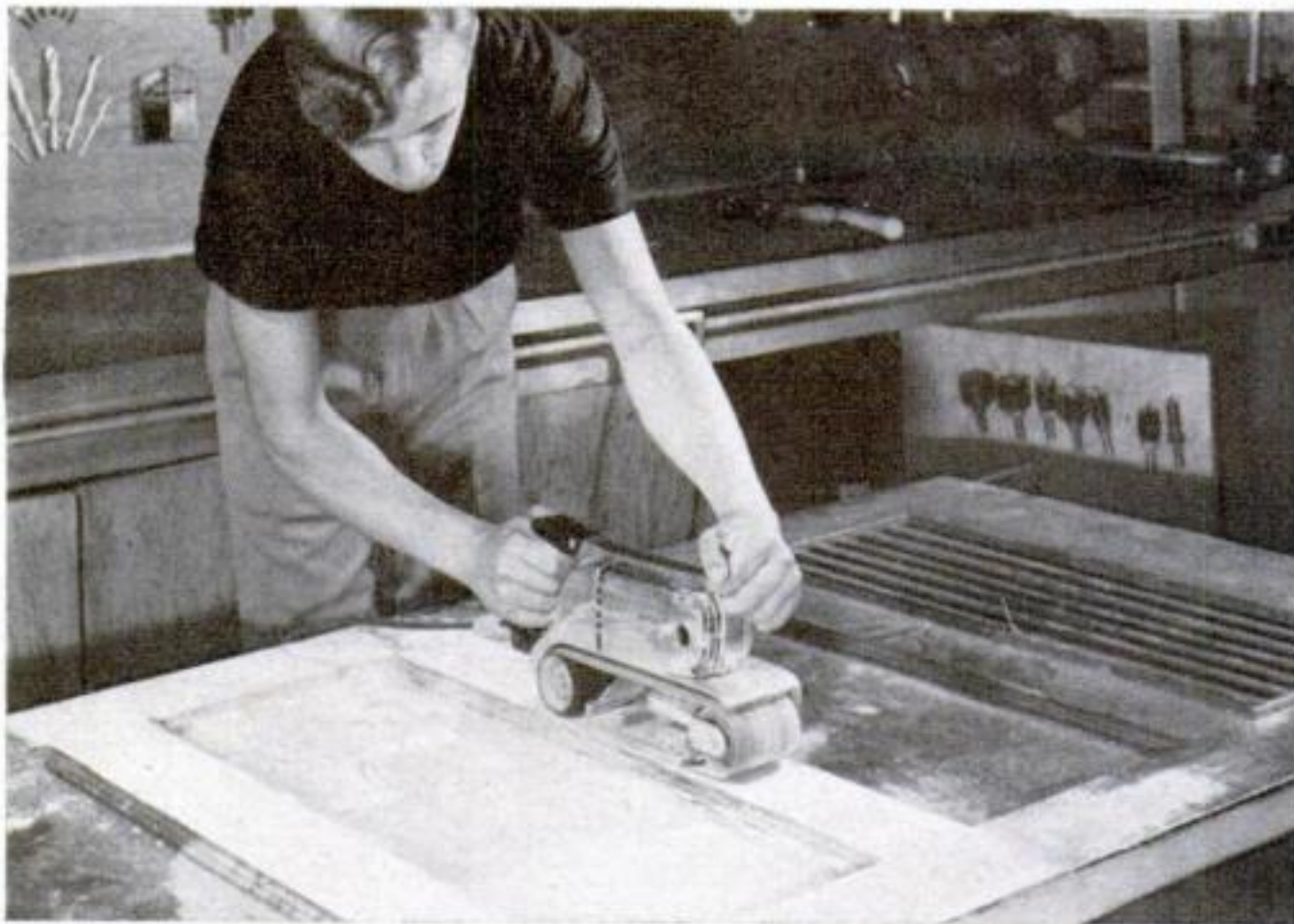
Besides independent, self-contained sanding machines with built-in motors, you can now buy sanding attachments for table and radial-arm saws, combination tools, and of course that jack-of-all-chores, the  $\frac{1}{4}$ " electric drill.

The following pages show a line-up of typical modern power sanders.

## **Portable belt sanders can tackle work of any size** .....

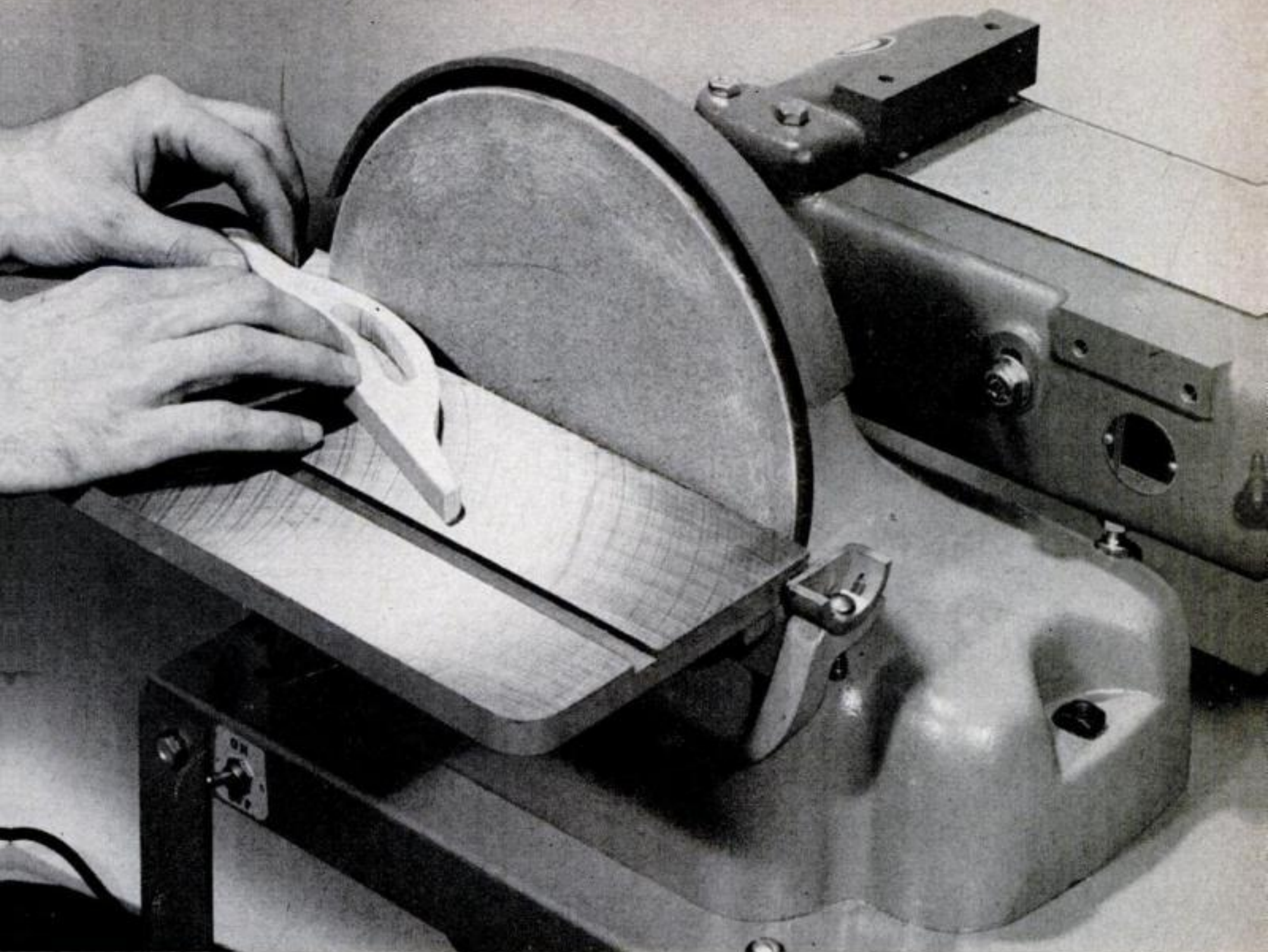
**T**ODAY'S do-it-yourself-er is discovering that a portable belt sander makes home repairs and remodeling much easier. With it, he can tackle anything from a birdhouse to a play-room wall. The straight-line action of its endless belt sands rapidly with a minimum of scratching.

These machines are sized by belt width, the 3" size being most suitable for home use. See that the belt runs flush with one side of the machine so that it can sand along corners. It should run over a steel shoe cushioned on cork or rubber. One roller should be adjustable for tracking.



**PROGRESSIVELY FINER GRITS** on a portable belt sander like the one above enable you to smooth work until only light hand sanding is required for a fine finish. Inside curves can be sanded on the exposed roller. Some of these machines are fitted with a blower and bag to swallow the dust raised in sanding.





**BELT-SANDER ATTACHMENTS** made for standard  $\frac{1}{4}$ " electric drills are popular for home use. They have a 2" belt, but the limited power of the drill motor makes them suitable only for light work. Overloading such an accessory may

burn out the motor, and care must be taken to keep the drill in line with the drive shaft. The more powerful portable belt sanders, clamped on their sides, can be used for sanding edges by sliding the work against the belt.

*Please turn the page for more about sanders*

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## **Finishing sanders bring out surface beauty.....**



**DRIVEN BY A ROTARY MOTOR**, an orbital sander like this one makes fast work of finishing cabinets, built-ins and walls. A knob affords two-hand control when the operator desires.



**A DUAL-ARC SANDER** such as this one, which is driven by a reciprocating magnetic motor, is especially well suited to such jobs as smoothing the wild grain of a fir plywood surface.



**ANY HUSKY 1/4" DRILL** can do light finish sanding with a suitable attachment. The one shown gives pad an orbital motion. Reciprocating types are also available.

**M**ORE powerful finishing sanders, with various kinds of motors and sanding actions, are now available to relieve you of tedious handwork. The heavy-duty, rotary-motor type will also do a fair amount of rough sanding.

On these machines, sheets of abrasive are clipped to a sole plate, which is driven in one of three motions: straight-line, orbital or circular, multiple or dual-

arc. Proper use and the correct grit will give satisfactory results with any one of these.

Some finishing sanders are driven by electromagnetic vibrators. Their sole plates move at high speed but with a short stroke. Heavier, faster-working machines are driven by rotary motors. Both straight-line and orbital attachments are available for electric drills.

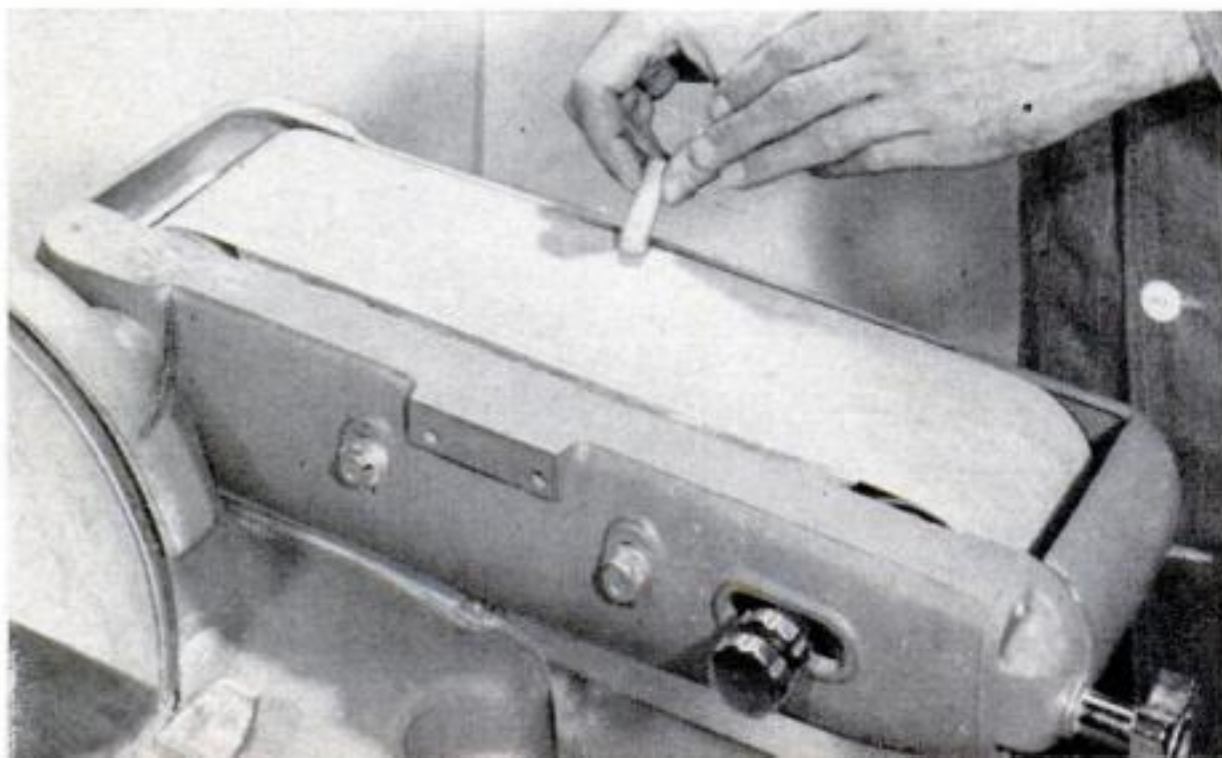
## **Bench sanders are both shaping and finishing tools.....**

**S**TATIONARY belt sanders will bring stock to size as well as smooth it. Since the work must be held to the tool rather than the tool to the work, these big machines are better for sanding parts than for smoothing assembled pieces. They have straight-line action.

Popular sizes take 4"- and 6"-wide belts. They can be run horizontally or tilted at any angle up to 90°. A table,

miter gauge and fence should be provided, and one drum should be exposed (or fitted with a removable cover) so that inside curves can be sanded on it. Adjustments for belt tensioning and tracking are important.

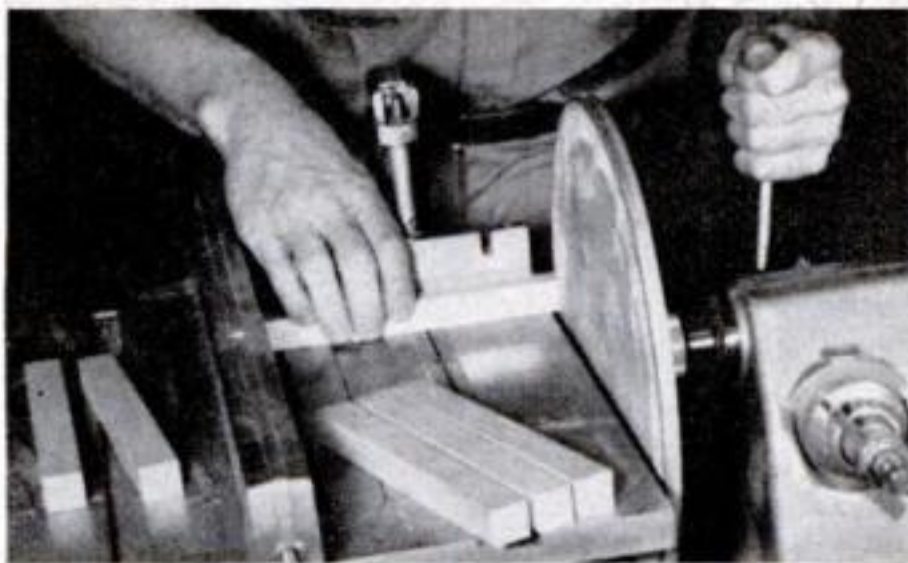
Stroke sanders are similar to belt sanders, but the work is placed under the belt, which is then pressed down on it with a wooden block or mitten.



**BELT AND DISK** are combined in the machine at left, which should be run by a motor of at least 1/3-hp. Its table (at extreme left) is slotted for a miter gauge and can be used with the disk or belt. A tilting fence (not shown) can be mounted parallel to the belt.



## **Disk sanders cost little but can do many chores. ....**



**MOUNTED ON THE SPINDLE** of this combination tool, a sanding disk can be moved lengthwise by the quill feed. This makes it useful for end-sanding pieces to length, as shown above. They are held against the miter gauge on the saw table, and the fence is locked to back them. The quill depth stop is set and the disk fed in each time as far as the stop permits.



**TAPERED EDGE SECTION** on this sanding disk, made for use on a circular saw, enables it to joint the edges of work fed between it and the fence. Other jobs can be done on it, too. Edges can be jointed against an ordinary sanding disk by setting the fence nearer it at the front. With either disk, the work is fed in from the back, where the disk turns upward.

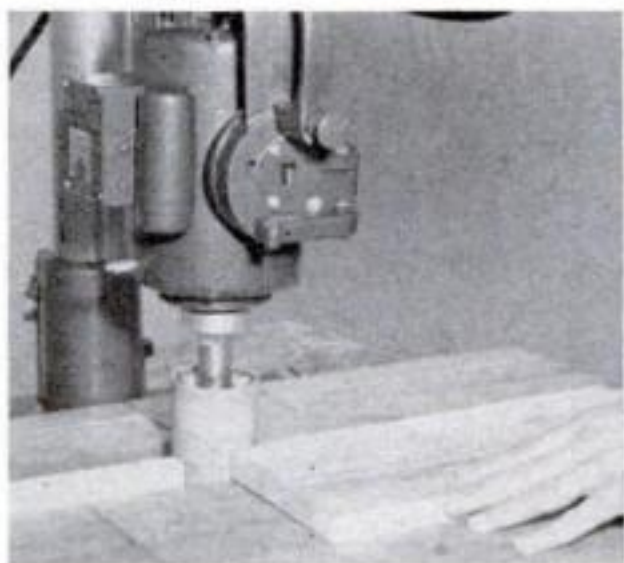
**WHIRLING** abrasive disks, though poor for surface sanding, do a fine job of stock removal. A disk sander will sand straight or convex edges, form and smooth miters, bevels and chamfers, and can be used to joint edges.

The simplest one is a rubber-backed

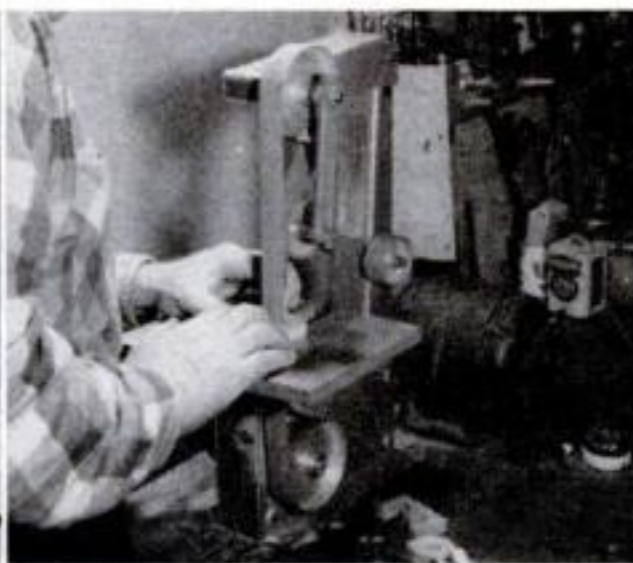
abrasive disk chucked in an electric drill. It will dress rough patches, remove paint, and even smooth concrete. Clamped in a stand, it serves as a light bench sander.

You can buy a disk for a table saw, radial-arm saw, or combination tool. A table and miter gauge expand its scope.

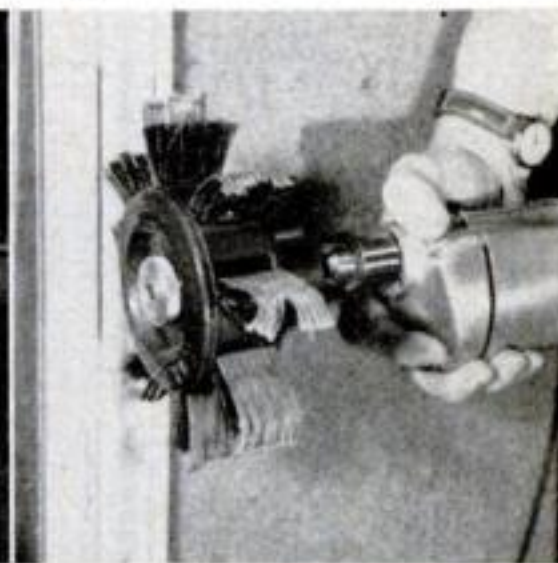
## **Drum, ribbon and flexible sanders handle offbeat jobs .....**



**DRUM SANDER** can be used for smoothing and truing up both curved and straight work. With a fence and coarse abrasive, it can joint edges, as shown above on a radial-arm saw.



**RIBBON SANDER** above has idler wheels that enable the belt to run around wide work, or to be threaded through openings as small as  $\frac{1}{8}$ " by 1". It can smooth jigsawed parts rapidly.



**SLIT STRIPS** of abrasive are whipped into corners and hollows by this contour sander. It can be readily used in electric drills, flexible shafts, or drill presses.

**MODERN** drum sanders are popular accessories for the saw, drill press, flexible shaft and electric drill. The 3" size is most useful.

A sanding drum is the best tool for sanding the inside of a ring by power. It is also excellent for freehand sanding of curved pieces such as cabriole legs.

Mounted on a saw arbor, it will do surface sanding.

Now updated for the home shop, a ribbon sander will smooth fretwork, lettering and interior cuts as no other can. Contour sanders whirl fingers of abrasive about to sand parts that even human fingers could not reach. **END**



# Station-Wagon Strongbox

**I**F YOU feel uneasy whenever you must leave cameras, golf clubs, hunting gear or other valuables in a station wagon, where the big windows display them to every passer-by, here is a simple "safe" to protect your possessions. It is a sturdy aluminum case that conceals belongings from prying eyes.

The case is screwed to the lid of the spare-tire compartment, but does not

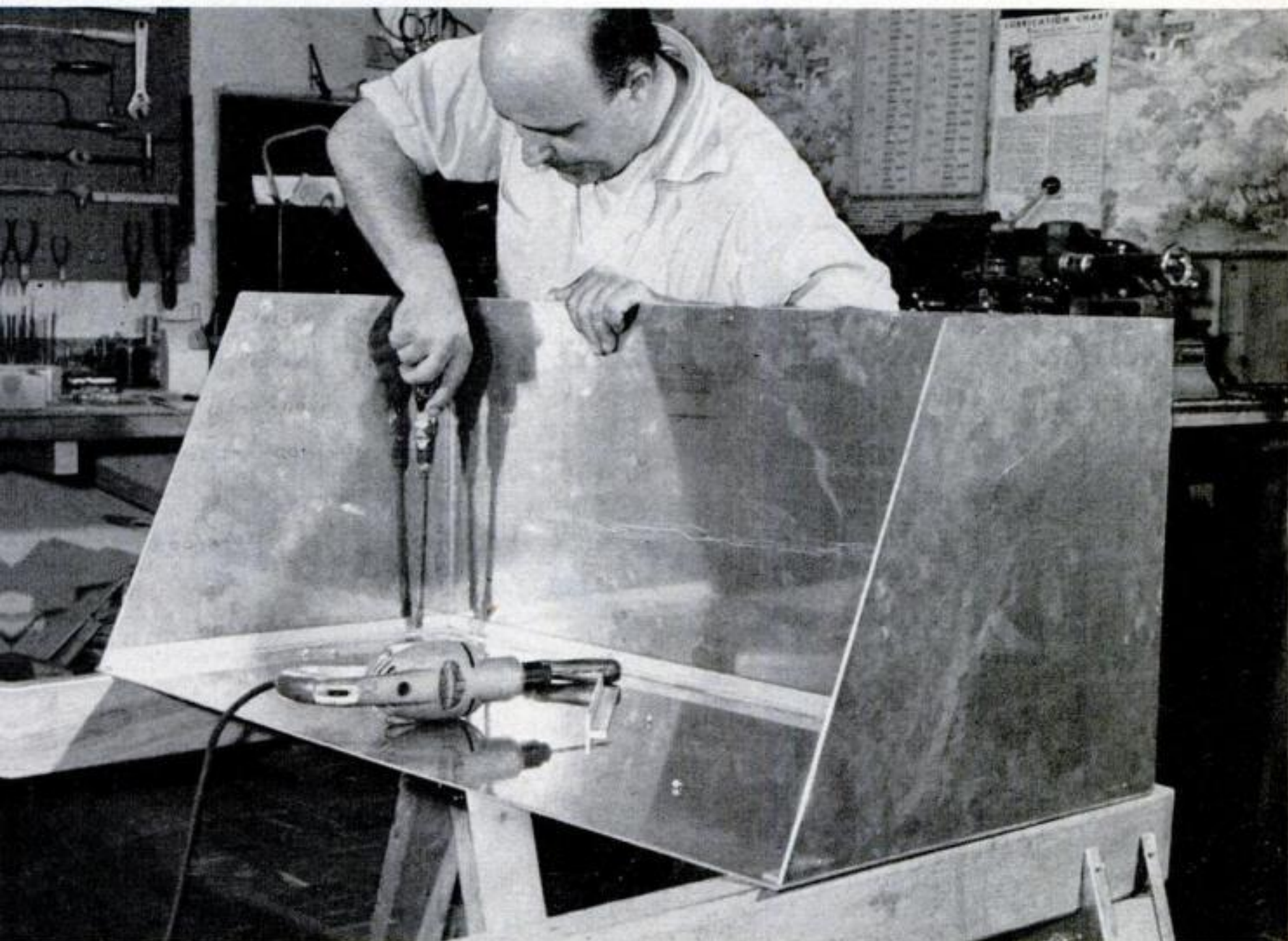
block access to it. You can easily remove the case, but nobody else can because the screws are driven into the station wagon deck from the inside of the box.

The case itself is hardly noticeable when painted to match the interior of your wagon. Properly made, it shouldn't rattle, but if it does, cement rubber weatherstripping along the lower edge of the lid to cushion it.—*Herbert Pfister.*





# Guards Your Valuables

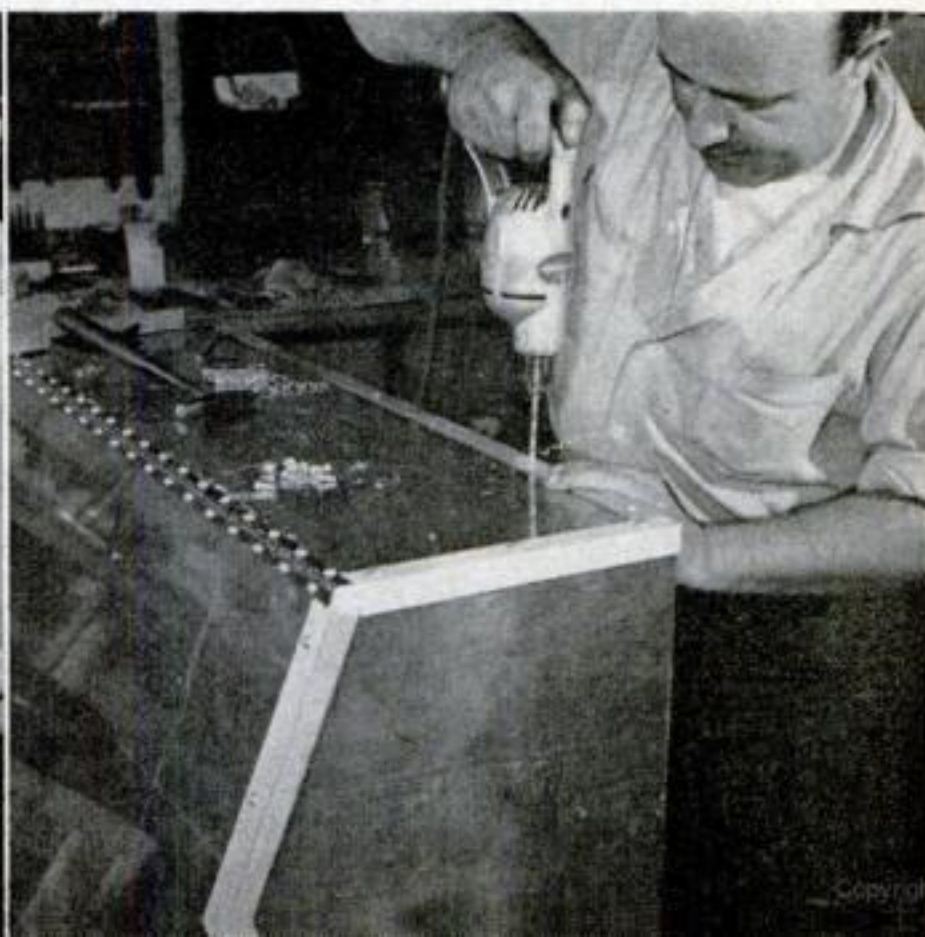
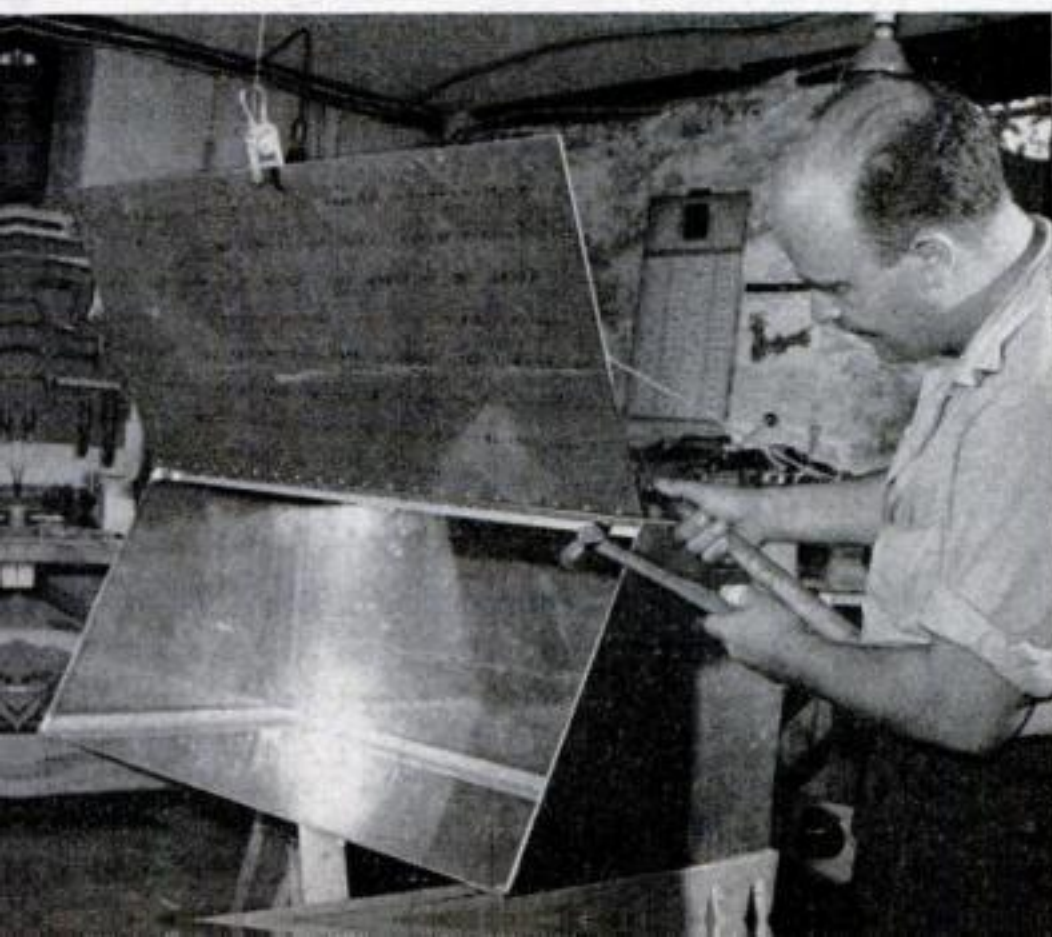


**JOIN THE SIDES, BACK, TOP AND BOTTOM** inside the case with aluminum angle, using a few machine screws inside to hold the parts together

**USE RIVETS** to fasten the piano hinge to the lid. Back up the rivet head with a heavy hammer in one hand and peen over the end of the rivet with a machinist's hammer in the other hand. Hold the lid open with a string and a clamp or spring clothespin while you work.

while you fit them into place. Tap holes in the sheet aluminum for the screws and file the ends flush on the outside of the box.

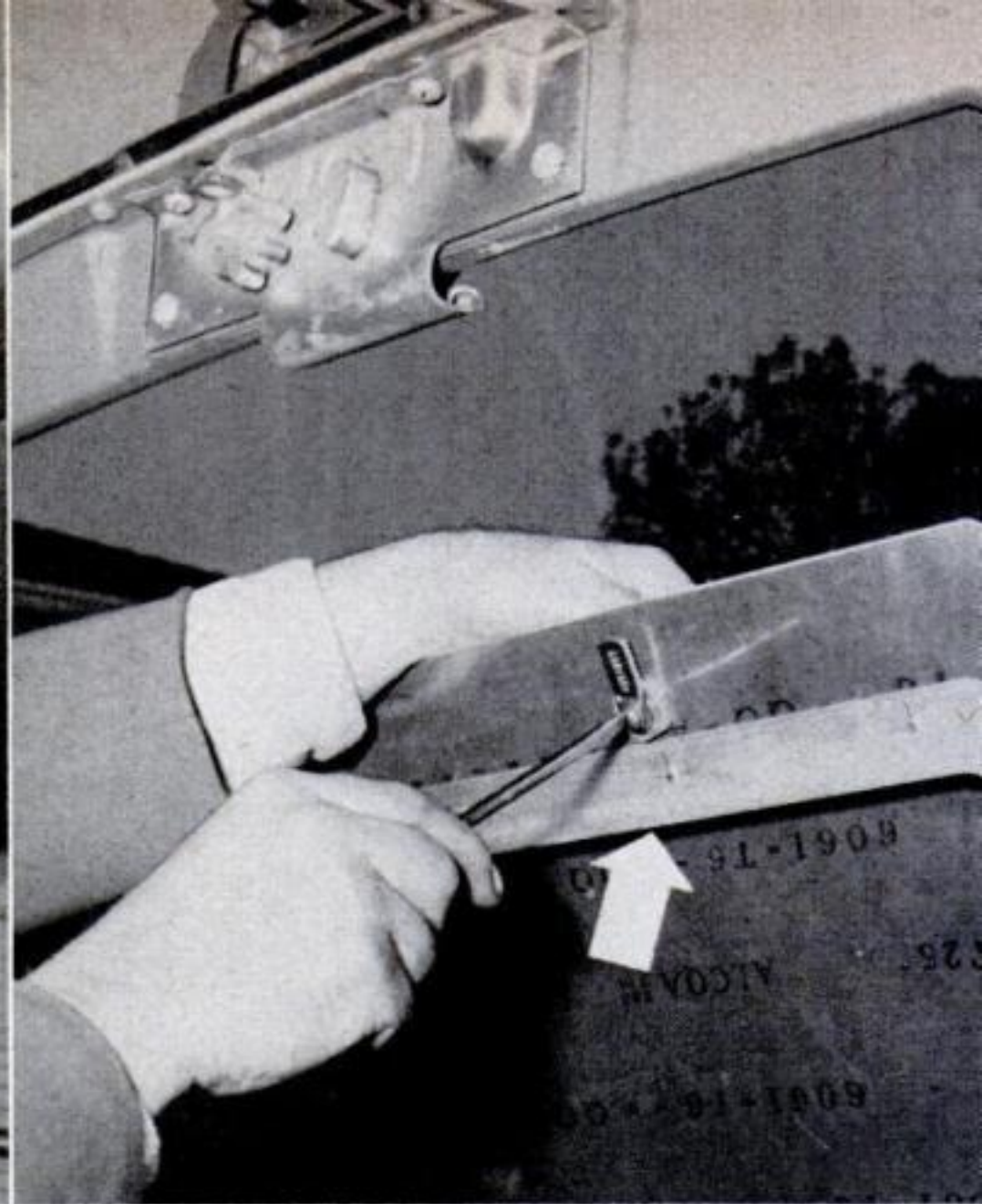
**BIND ALL OUTSIDE CORNERS** of the case with 1"-by-1" aluminum angle riveted in place. Also rivet angle along the edges of the lid to overlap the sides. This will prevent anyone from inserting a bar under the lid to pry open the case for a look inside. (Please turn the page.)



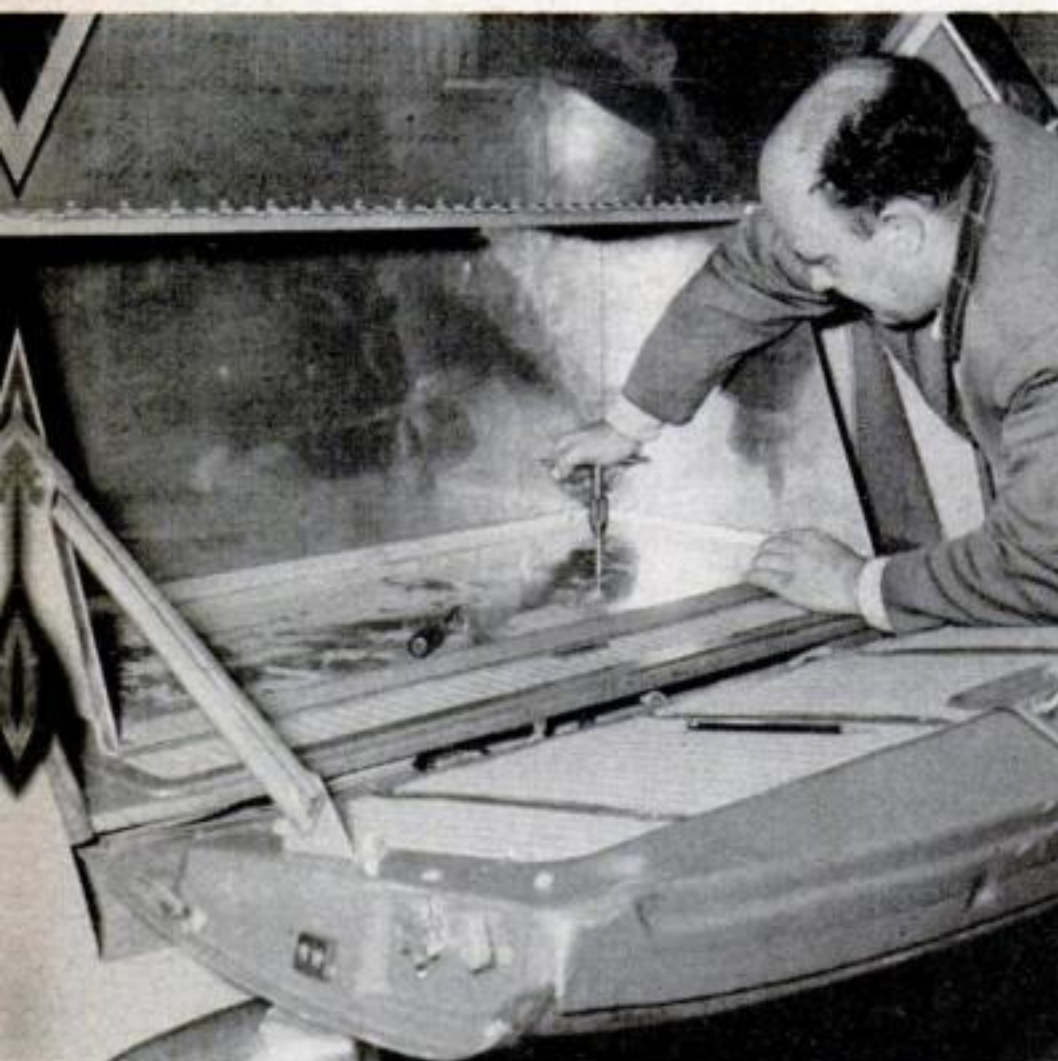




**INSTALL A CABINET LOCK** in a hole that is shaped to fit the lock barrel. Locks made for steel cabinets are too short to fit  $\frac{1}{8}$ " aluminum lid, so buy the type used for wood cabinets and shim it out with a brass-tubing collar, which will also serve as a knob to pull up the lid.



**SCREW TONGUE** on the lock after installation, bending it if necessary so it will lock snugly behind  $\frac{3}{4}$ "-by- $\frac{3}{4}$ " angle riveted along the bottom edge of the box. The 1"-by-1" angle on the inside (arrow) stiffens the lid to keep it from being sprung open at the sides.



**DRILL FOUR  $\frac{1}{4}$ " HOLES** in bottom of the box, then, with the box in position, drill through them into the wagon deck with a No. 7 drill and tap the holes  $\frac{1}{4}$ "-20 for four machine screws. Install the screws from *inside* the box so that an intruder can not remove them when the box is locked.



**LUGGAGE CASE** need not be removed to get at the spare tire, since the hinged lid of the spare-tire compartment lifts up with the case on it. Buy enamel that matches the car interior—car dealers usually stock this—and paint the box to make it less conspicuous. **END**



## A Pet Bunk From Wordless Workshop

PROOF that cats and dogs can live together peacefully is shown in this pet double-decker bunkbed made by Warner G. Tilsher of South San Gabriel, Calif. It's easy to make, as artist Roy Doty showed you last month [Wordless Workshop, pp. 170-71]. And with a cat that likes to jump, there's no argument over who gets the upper berth.

►►► An inexpensive atomizer filled with light oil is handy for spraying small tools that you want to keep rustproof.



## Wall Jig Has the Right Slant

TO GET a uniform slant on a wall that I was building, I made this wood jig with the diagonal piece set at the correct angle. In the vertical piece, I cut a rectangular hole for a carpenter's level, so that I could keep the jig aligned. Wing catches on both sides hold the level in the upright piece, which I made the same thickness as the level's frame.—Victor H. Lamoy, Upper Jay, N. Y.



## Hammer Claw Strips Wire

You can use the claw of a hammer to strip insulation from wire. Score the insulation at the desired length. Set the slit in the notch and pull with your thumb braced against the claw face.

## Auto Jack Pulls Out Fence Post

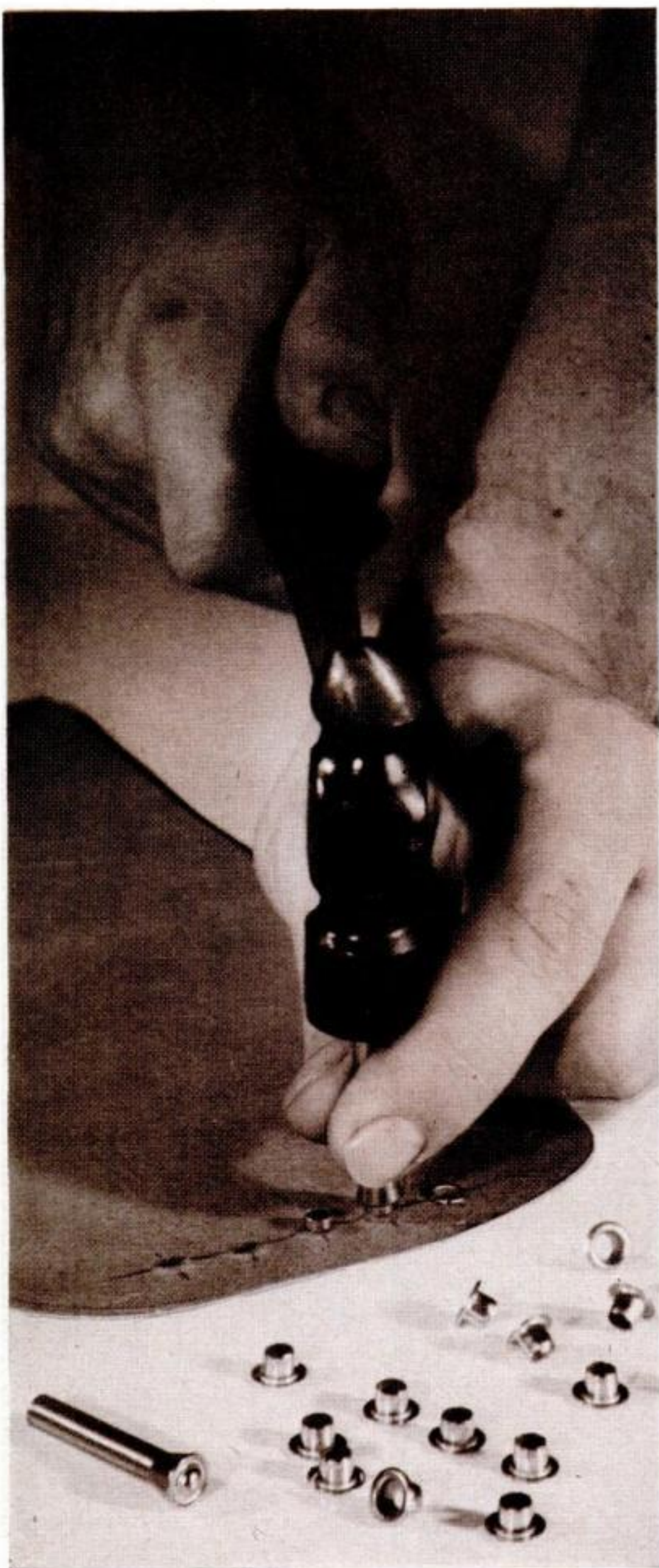


LIFTING a fence post out of the ground is simple with an auto bumper jack. Loop a chain around the post and slip a link over the jack's hook. The chain will pull as the jack is raised.



# What You Can Do with

***These all-purpose rings put holes to work on a houseful of tricky jobs.***



**COLORFUL CORD** strung through eyelets in cardboard can decorate many novelties like this "wastebasket" cigarette holder. The sides are  $2\frac{1}{2}$ " wide at top,  $1\frac{7}{8}$ " wide at bottom, and  $2\frac{3}{4}$ " high. Small eyelets like these ( $\frac{1}{4}$ " ) can be clinched with the crimping tool shown at left or by using a  $90^\circ$  center punch.



**EYELETS TRIM HOLES** for screws in hardboard and plywood. They help prevent splitting, won't fall off as washers may. Drill the holes to a snug fit and use oval-head screws.



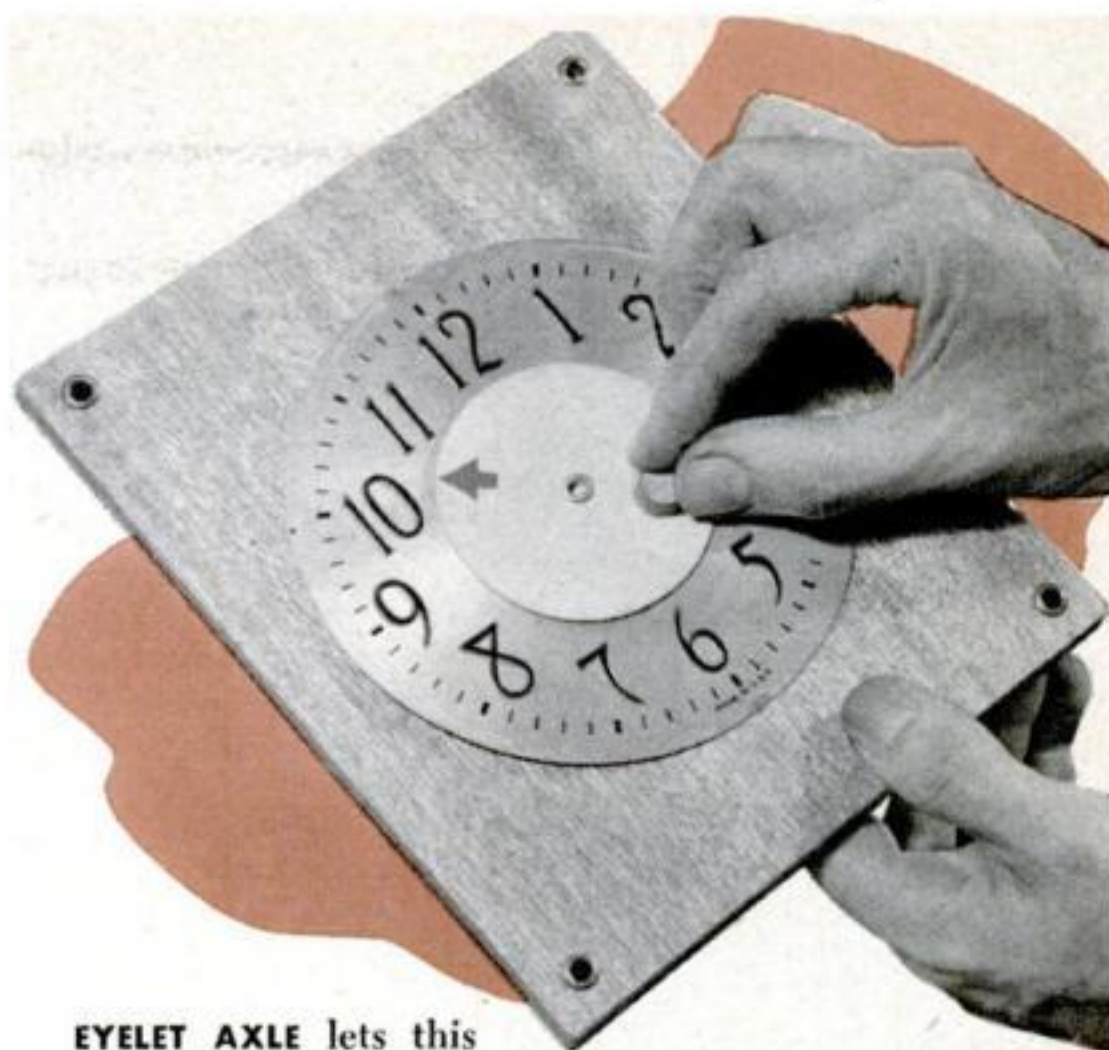
# Eyelets

By Walter E. Burton

**I**F YOU can sweet-talk your wife out of some of those eyelets that she keeps in her sewing basket, you'll find that they make many jobs easier around the home and shop. Besides reinforcing holes—that's what they are made for—these metal rings become rivets, bearings, axles for rotating parts, fasteners for wood and metal, and decorative ornaments.

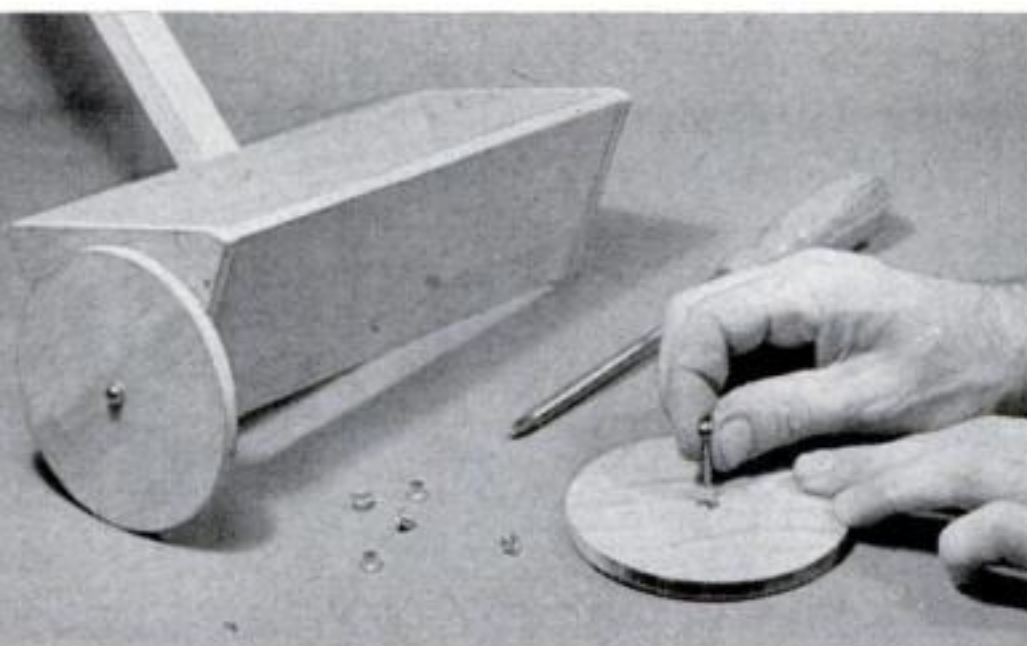
All sizes and types of eyelets, or grommets, from tiny  $\frac{1}{8}$ " ones to big shower-curtain rings, are available at dime stores and other sources of sewing supplies. Most of them now come packaged with their own crimping tool. You just give it a whack with a hammer to lock the eyelet in place.

In soft materials, such as light fabric, the eyelet will cut its own hole. Heavier stuff—metal, wood, thick cloth, leather—should be drilled or punched before you insert the eyelet.

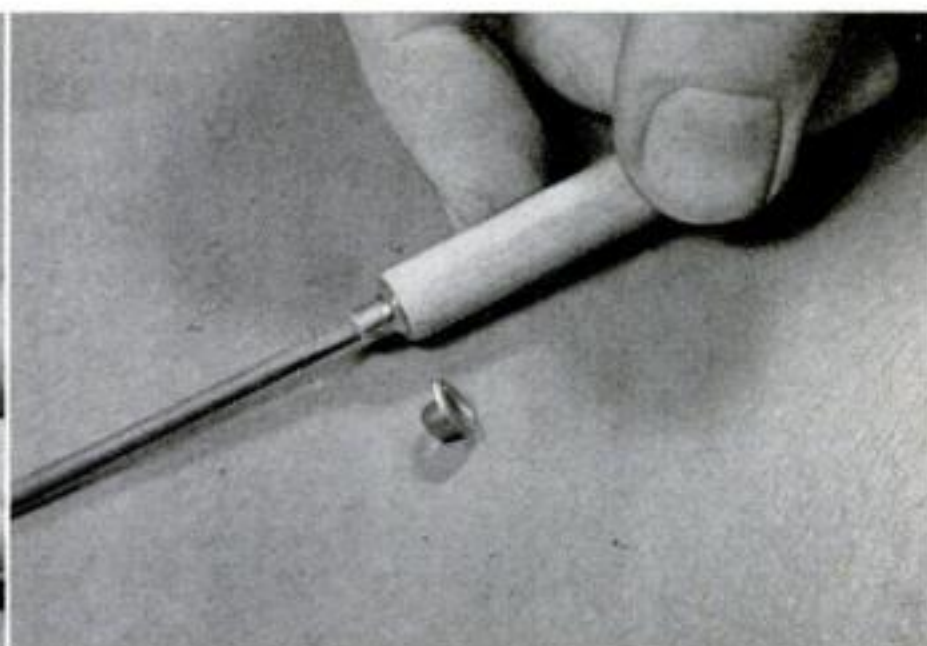


**EYELET AXLE** lets this cardboard pointer pivot around an old clock face to remind you when film is developed or a TV program comes on. Hammer the eyelet into the wood lightly so that the pointer will be able to turn freely.

**CANVAS SACK** makes a quick job of packing camping supplies or tools in a car. Put large-size eyelets along the edges of a 4' square of cloth; thread clothesline through the holes to draw the sides up tight.



**WOODEN WHEELS** for toys and other rotating parts will run truer and wear longer if you insert eyelets for bushings. If wood is thick, drive eyelets in from both sides; if thin, crimp the eyelet barrel over a washer to hold it on.

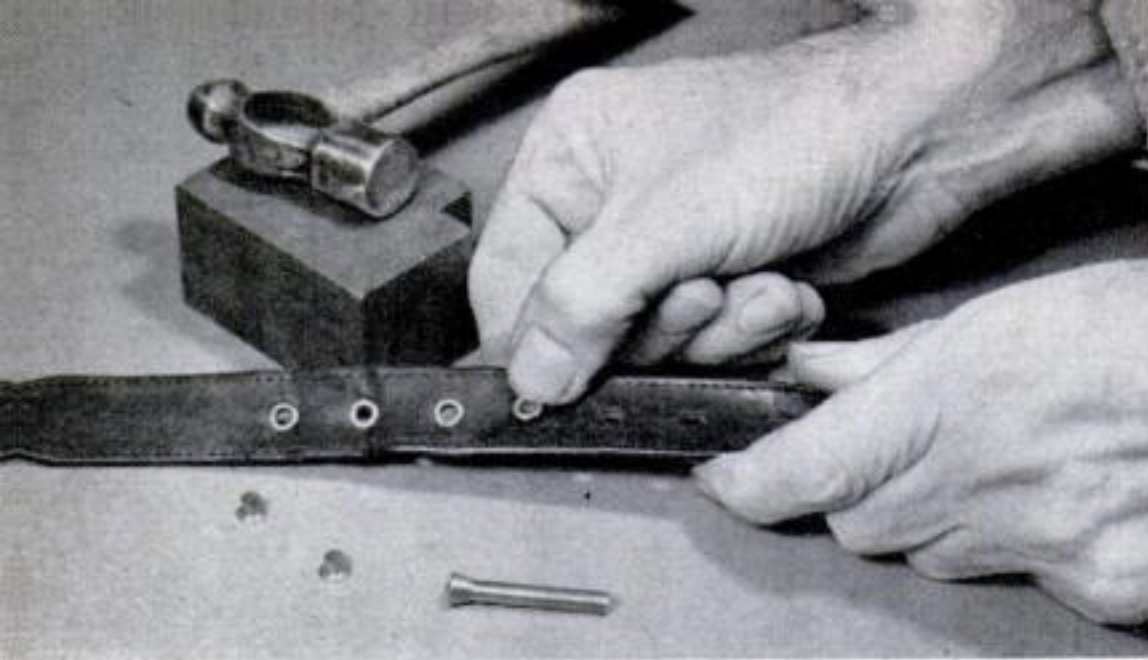


**HOMEMADE HANDLES** for small files and other tools are easy to make with  $\frac{3}{8}$ " hardwood dowels and eyelets for ferrules. Pinch the barrel tightly around the tool, then flatten the rim against the dowel on a vise anvil.

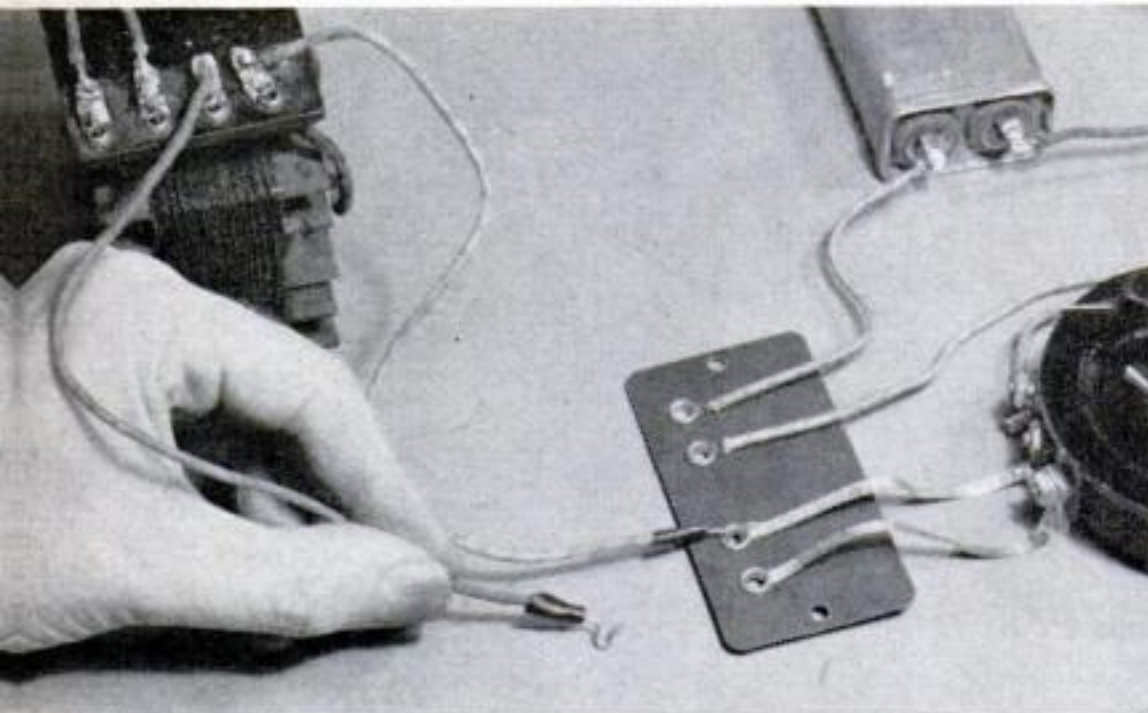
Please turn the page for more about eyelets

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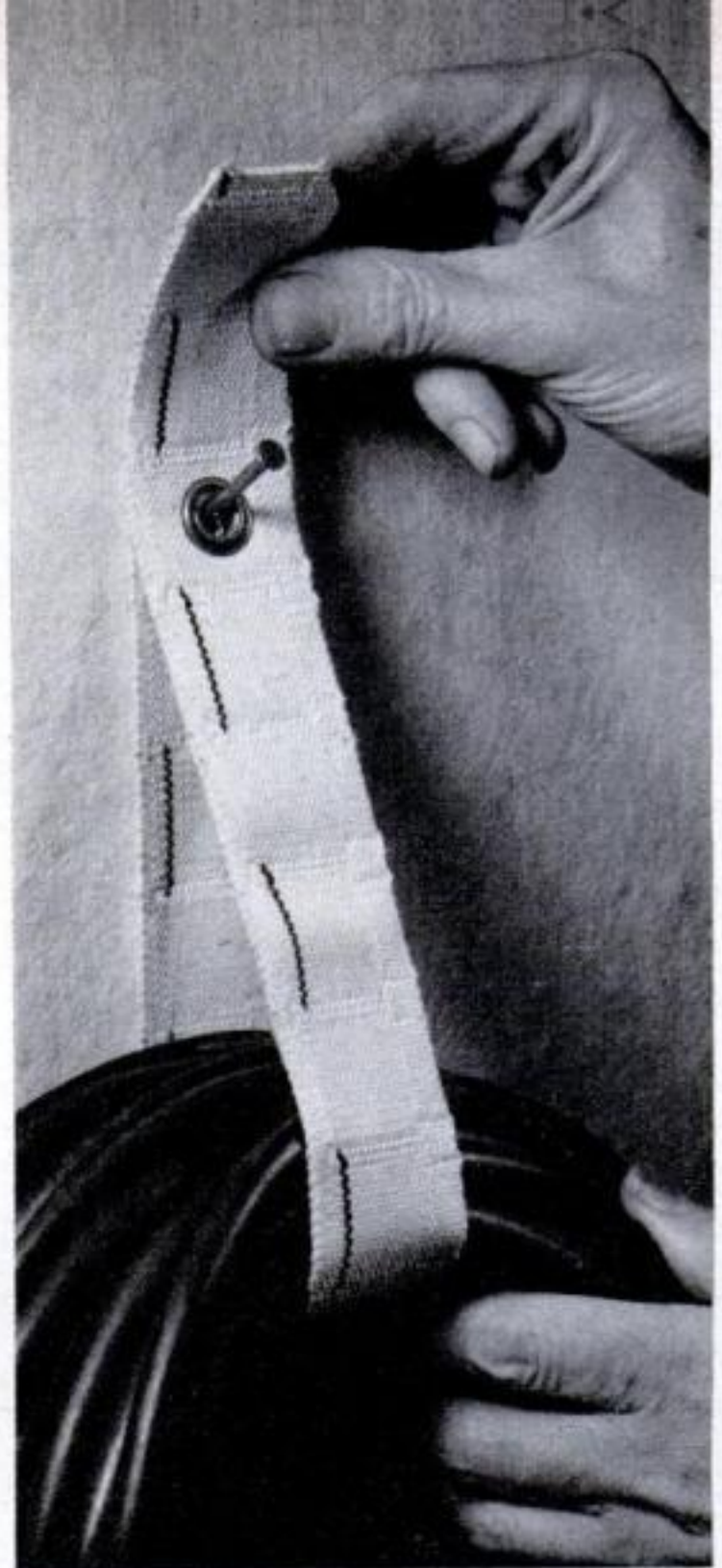




**YOU CAN MAKE NEW BELT HOLES** or reinforce old ones by inserting eyelets this way. Use a small metal tube or a hollow drive punch to cut new holes—to match eyelets—in the leather first. For cloth belts, you can get enameled eyelets in matching or complementary colors.



**TERMINAL STRIPS** for radio and electrical work can be made by hooking wires into holes drilled in fiberboard. When eyelets are pressed into the holes and crimped, they lock the wire ends in place. You can also make snap-in connectors for test hookups by bending U-shaped tips that fit snugly, for contact, into the eyelets.



**STRAP HANGER** with the eyelet hooked over a nail neatly holds your garden hose. Eyelets will cut their own way through thin cloth, but on thick material it's best to precut a hole that is the same size as the eyelet's barrel.

**TWO TYPES OF EYELETS** that are generally available are shown below. The larger ones come in two halves that are clinched together between

inexpensive punch-and-die tools (top left). Small one-piece eyelets have a barrel that is spread apart to hold them in place.



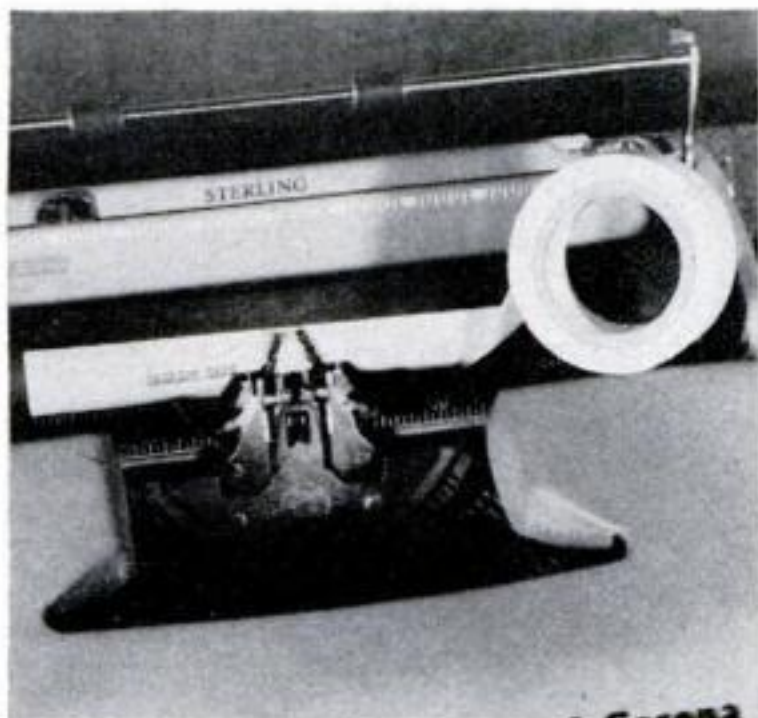


## Heel Makes Sharpening Pad

IF YOU sharpen wooden stakes frequently for your garden, nail an old rubber heel near the top of a fence post. It will make a handy pad against which you can point the stake with a hatchet. Attach the pad with finishing nails, and drive them in deep, to avoid nicking the tool.—W. N. Skourup Jr., Des Moines, Iowa.



## DO IT THE EASY WAY



**TYPE DIRECTLY ON MASKING TAPE** to make labels without feeding small bits of paper into a typewriter. Just stick the tape to the platen, type, and peel it off.

**HOT WATER** keeps a sharp point on your shop crayons. Just dip the crayon end and shape the softened wax with your fingers. There's no waste, this way.



**TO SAND A TRICKY CURVE**, wrap the abrasive paper around an old deck of cards. The cards slide when you press down, and will conform to almost any shape.

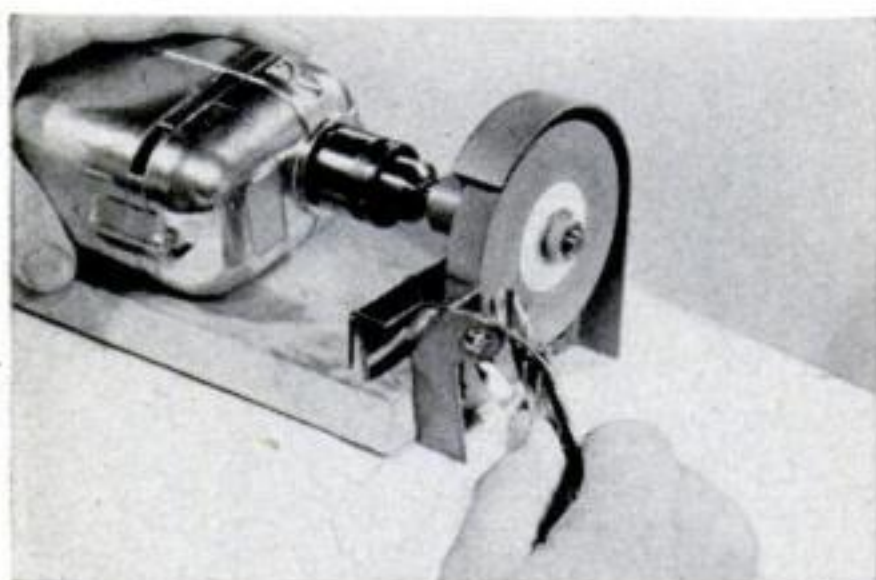
**SHELLAC IS ALWAYS HANDY** to cover a knot or seal a plaster patch if you store some in a rubber-cement jar, which has a small brush built into its cap.





# New Tools

**1. Ten Power Tools in One.** This small Netherlands-made lathe (7" between centers) has 11 variable speeds from 375 to 9,200 r.p.m. Using accessories supplied with it, you can set the machine up as a drill press, milling machine, tool grinder, polisher or hand drill. Additional attachments are also available for adapting it for use as a jigsaw or table saw and for threading, indexing and dividing.

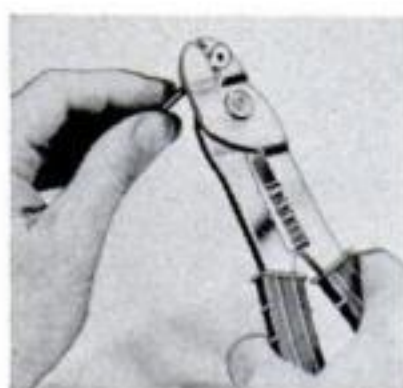


**2. Drill Sharpens Its Bits.** A pivoted tool rest holds drill bits at the right angle against this grinding-wheel attachment for an electric drill. The shaft of the  $\frac{1}{2}$ "-by-3" wheel fits  $\frac{1}{4}$ " drills.

**4. Tool Grinds Chain-Saw Teeth.** Keeping a keen edge on a chain saw is easier with this new power sharpener. A guide at the shaft holds it at the correct angle. It comes with two adapters and will also sharpen chisels and other tools.



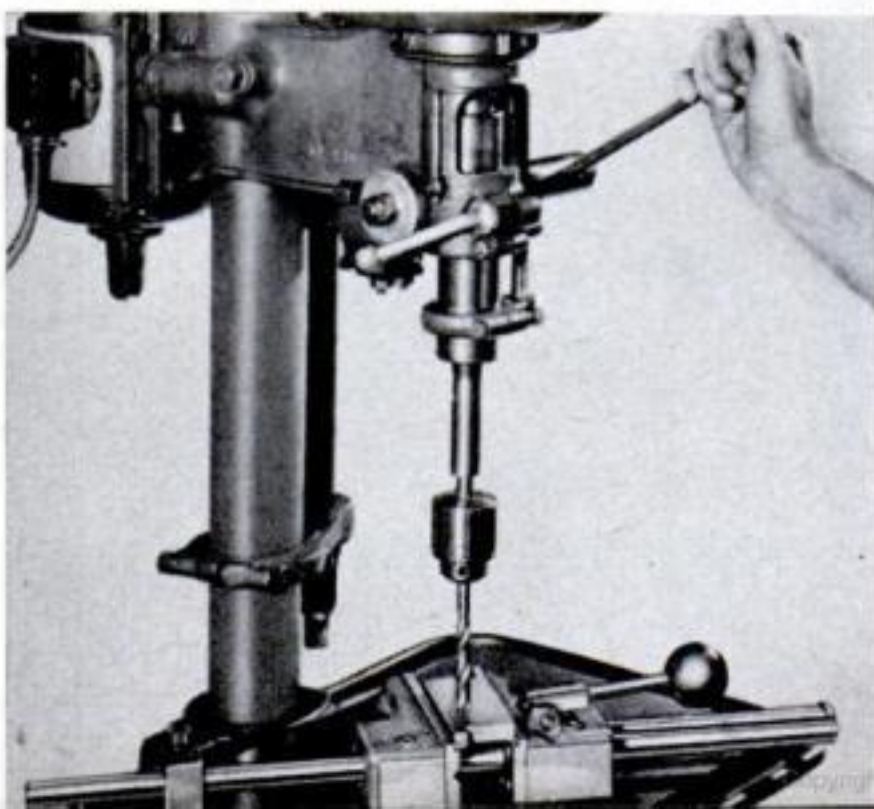
**3. Terminal Kit Uses No Solder.** If you would rather not bother with solder, a new kit will help you crimp terminals to wires in TV and model circuits. It



contains a cutting, stripping and crimping tool having a series of slots for various sizes of wires, a screwdriver and an assortment of the terminals.

*More information about the products on this page can be obtained from: 1. American Edelstaal (Amsterdam), Inc., 350 Broadway, NYC 13; 2. Popular Mfg. Co., 4115 Glencrest Road, Minneapolis 16; 3. Vaco Products Co., 317 E. Ontario St., Chicago 11; 4. Mall Tool Co., 7728 S. Chicago Ave., Chicago 19; 5. Heinrich Tools, Inc., 1536 Clark St., Racine, Wis.*

**5. Drill-Press Vise Locks on Table.** A corner clamp fastens this 6"-capacity vise to a drill-press table. You swing it off the table when it is not in use. A similar but free-moving vise is made for use with bandsaws and jigsaws.

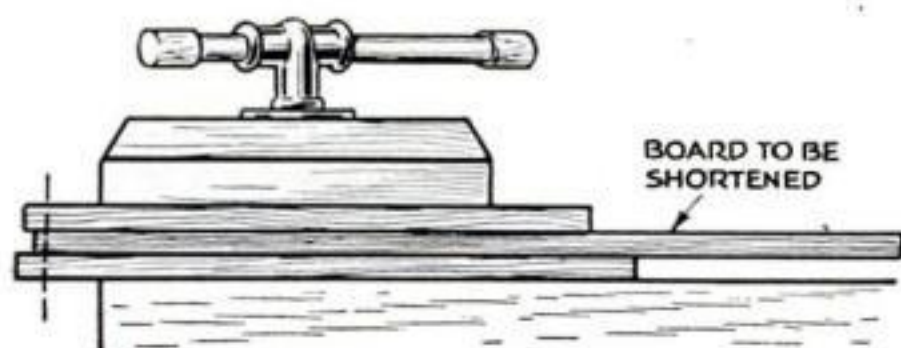






## Hacksaw Cuts Sandpaper

A QUICK way to cut sandpaper to size is with a hacksaw blade nailed loosely to the bench. Slip the sheet under the blade and rip.—*Jan Olsson, Seattle, Wash.*



## How to Shorten a Board

HERE'S a trick that will help you shorten a board as little as  $\frac{1}{16}$ ". Place the board between two overlapping pieces of scrap and clamp them in the vise. Saw through the scrap and board at the same time.—*Harvey Muller, Danboro, Pa.*



## Hot Plate Is Soldering Aid

MOST of the heat from a soldering iron is used in warming the piece of work, not the solder. When my iron can't handle a big job, I help it along by preheating the piece to be soldered on an electric hot plate.—*H. Y. Moon, Orient, N. Y.*



## Pad Filler Is Chopped Tubing

SOFTEN that hard seat at the stadium, on your boat or metal furniture by using a rubber-filled seat pad. For the filler you can mince  $\frac{1}{4}$ " strips of wetted inner tube in an old food chopper. Use a fine cutter.—*Bruce D. Stewart, Winder, Ga.*



## Boat Ladder Aids Swimmers

BY TYING on a wooden step, you can make it easy for young swimmers to climb into a boat. The step is a block of wood with a hole bored near each end to take a  $3\frac{1}{2}$ ' length of rope knotted at the ends. Mount an eye plate on the deck. Slip the doubled end of the rope through it and put the step through this loop.



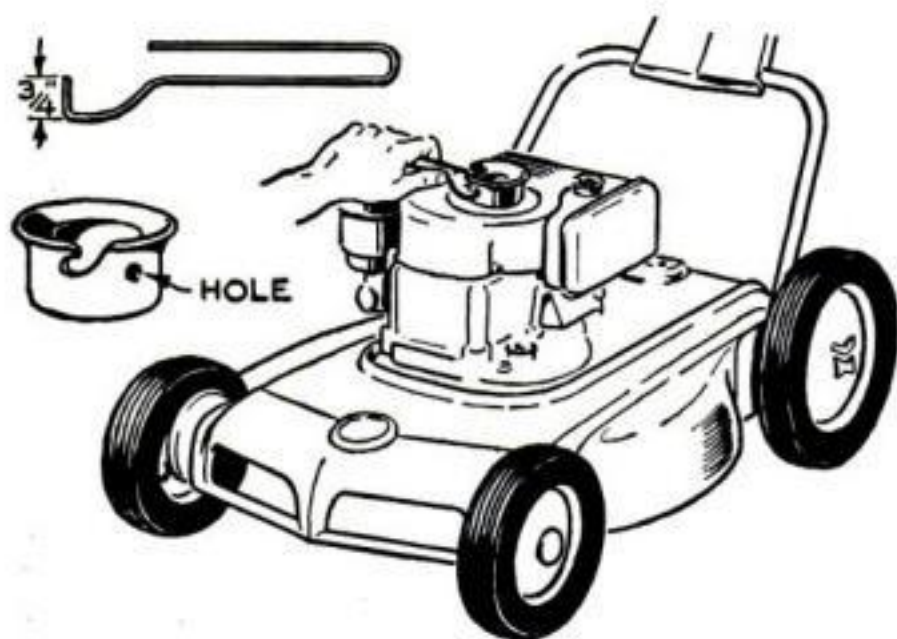
# Tips on Your Power Mower



## Mow at Night with Headlight

**Rx:** Take one 10" aluminum mixing bowl, one lamp socket, threaded sleeve and nut, a mounting bracket and bolts, and a short length of lamp cord. Assemble on an electric mower, and insert a light bulb. Then enjoy mowing the lawn in the cool of the evening.

The headlight shown works fine on my electric mower with the lamp cord plugged into a cube tap in the power line. It can be adapted for a gasoline mower by using a flashlight bulb and battery.—*M. Roscoe Siceloff, Winston-Salem, N.C.*

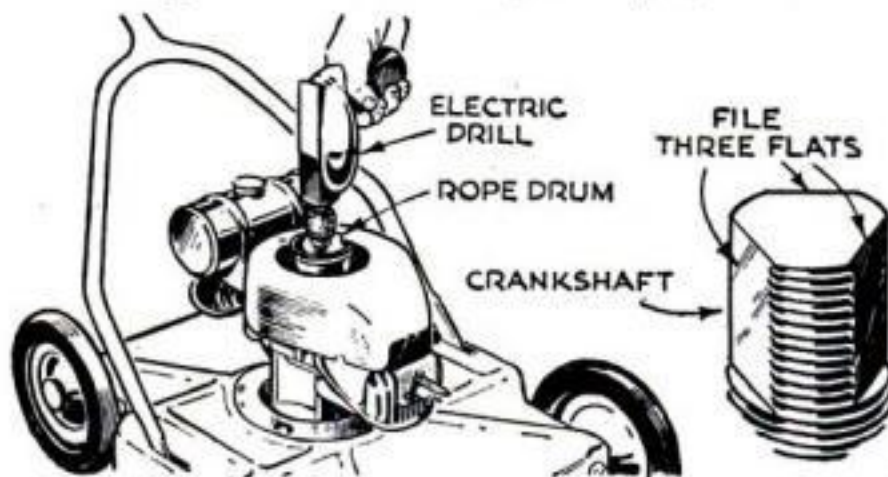


## Wrench Helps Loosen Blade

A **HOMEMADE** spanner wrench is a help when you have to remove the blade from a rotary power mower. Bend the wrench to the shape shown above at left from a 14" length of  $\frac{1}{4}$ " steel rod. Insert it into a  $\frac{5}{16}$ " hole drilled in the starter-rope pulley, and it will keep the crankshaft from turning while you unscrew the bolt.—*Harold Gauthier, Cottonport, La.*

## Drill Cranks His Lawn Mower

My  $\frac{1}{2}$ " electric drill cranks the power lawn mower for me. I filed three flats on the threaded end of the crankshaft where it sticks above the rope pulley, as in the drawing below. I can tighten the drill chuck on these flats without damaging the threads. Electric cranking is especially helpful after an overhaul, when the engine is hard to start because the carburetor needs adjusting—and the adjustment must be done with the engine running.—*H. Landauer, Tampa, Fla.*





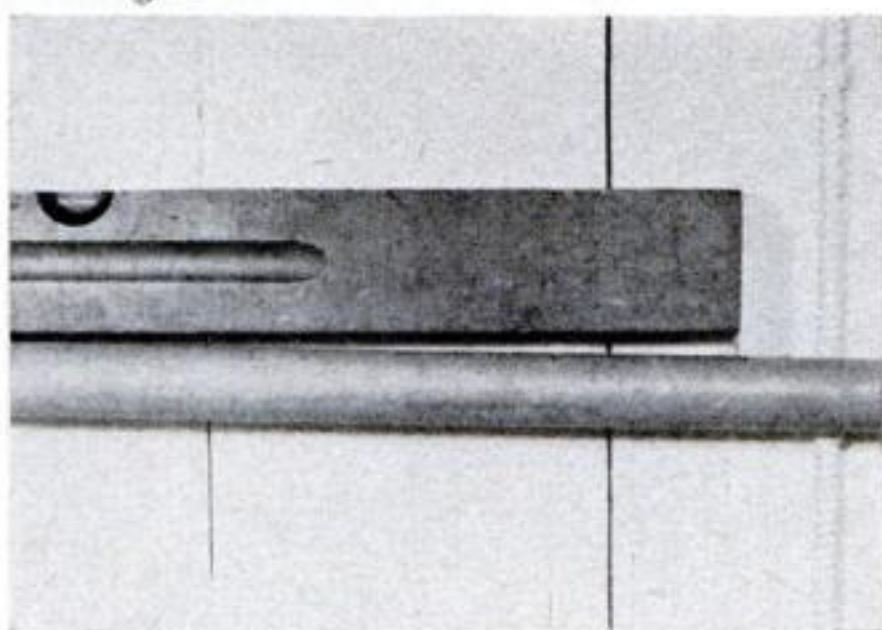
## How to Repair Wallpaper So You'll Never See the Patch



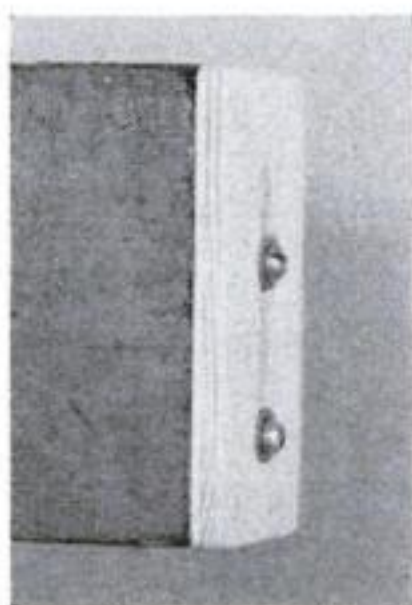
MY WAY of patching wallpaper guarantees a finished job that will be practically invisible.

From a spare roll, cut a piece about four times as large as the damaged spot. Slide this around over the spot until all edges match perfectly. Holding the patch in place, peek under to see where the damaged spot is. Cut around the spot with a razor blade or knife, allowing  $\frac{1}{2}$ " margin. Press hard enough to go through both layers of the paper.

Then soak and scrape the area inside the cut line to remove all the old paper. Apply paste to the patch and fit it carefully into place. Sponge off the excess paste.—Karl Greif, Vestal, N.Y.

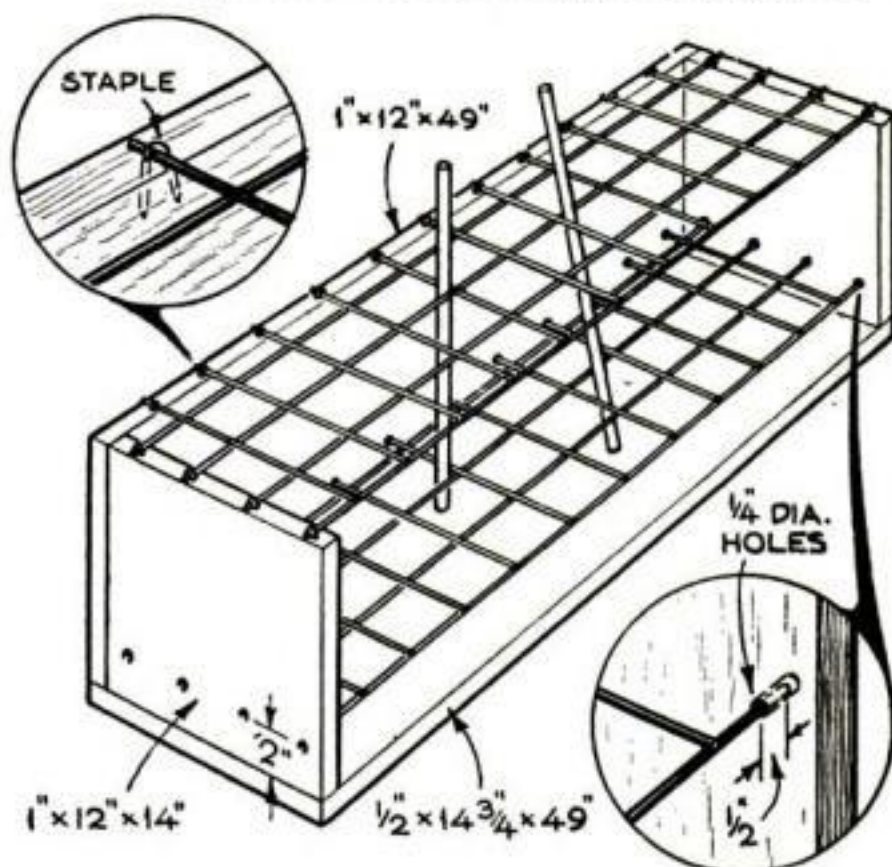


### Slide on Level Adjusts for Pitch



A SLOTTED strip of plywood screwed to the end of a level will help you get the proper pitch on such jobs as the drainpipe installation above. It is far more accurate than judging a "half-bubble" by eye or poking a finger under one end. Cut

the compensator to an exact fit for the end, as at left. The length of the slot and spacing of screws depend on the maximum pitch you will be likely to need.—Herbert Y. Moon, Orient, N.Y.



### Mesh Rack Keeps Dowels Sorted

STEEL mesh stretched in a wooden frame makes a convenient pigeonhole rack for dowels and other narrow material. You need a 2'-by-4' piece of 10-gauge mesh having 4" openings. This is cut in half the long way.

Trim the ends and one side of the two strips of mesh so that wire tips protrude. Stick the tips on one piece into  $\frac{1}{4}$ " holes drilled in the back and ends of the rack, which is cut from 1'-by-12" boards. The top strip is then stapled in place.—Russell Love, San Marino, Calif.



# Junked Refrigerator Cools Darkroom

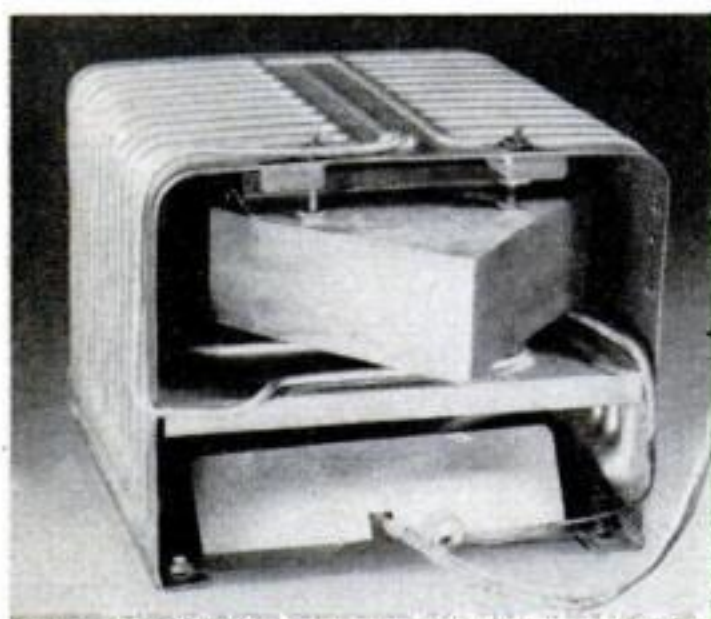
**H**OT weather made my 6'-by-8' basement darkroom so torrid that I envied prints their bath in warm hypo. Buying an air conditioner was out of the question. But with a junked refrigerator mechanism that I wangled from an appliance dealer for \$10, and an old fan, I made one myself.

The system was left sealed to avoid loss of refrigerant, care being taken not to bend the tubing unduly. As the condenser had to be outside the darkroom for heat transfer, a hole was cut in the partition and the freezing unit was passed through. The hole was then covered. The control thermostat was removed and its leads connected to an on-off switch.

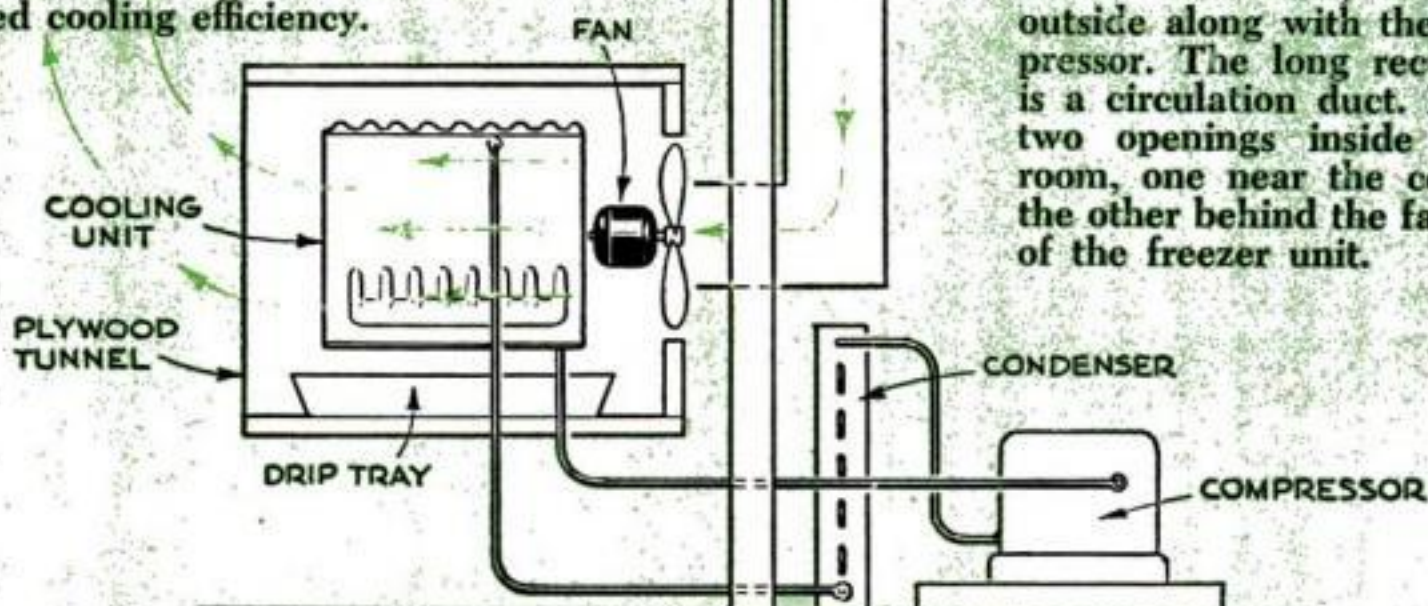
Although the cooling capacity of such a unit is only about 1/6 ton, mine lowers the darkroom temperature five to 10 degrees per hour. It means the difference between sweltering and comfort.—*John J. Simpkins, Great Neck, N. Y.*



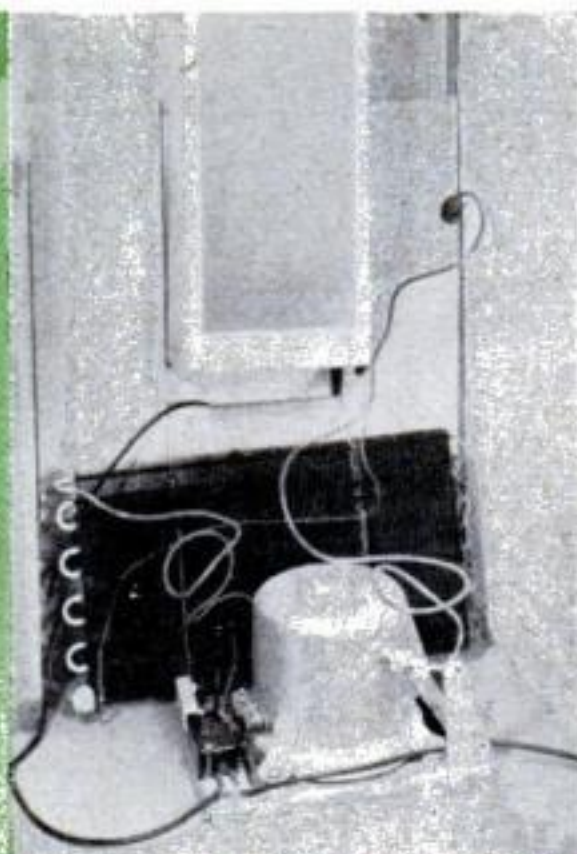
**A REFRIGERATOR FREEZING UNIT** on the lower shelf of the darkroom bench not only cools the air but dehumidifies it. Water condensed out of the air drips into a tray placed under the unit.



**USED UPSIDE DOWN** from its position in the refrigerator, the freezer unit is fitted with a new bottom plate shaped to funnel off condensation water. Fan goes at the end shown here. A V-shaped baffle in one section and a sloping one in the other direct the air flow from the fan against the cold walls for increased cooling efficiency.



**HEAT PUMPED OUT** of darkroom is thrown off by the finned condenser, mounted outside along with the compressor. The long rectangle is a circulation duct. It has two openings inside darkroom, one near the ceiling, the other behind the fan end of the freezer unit.





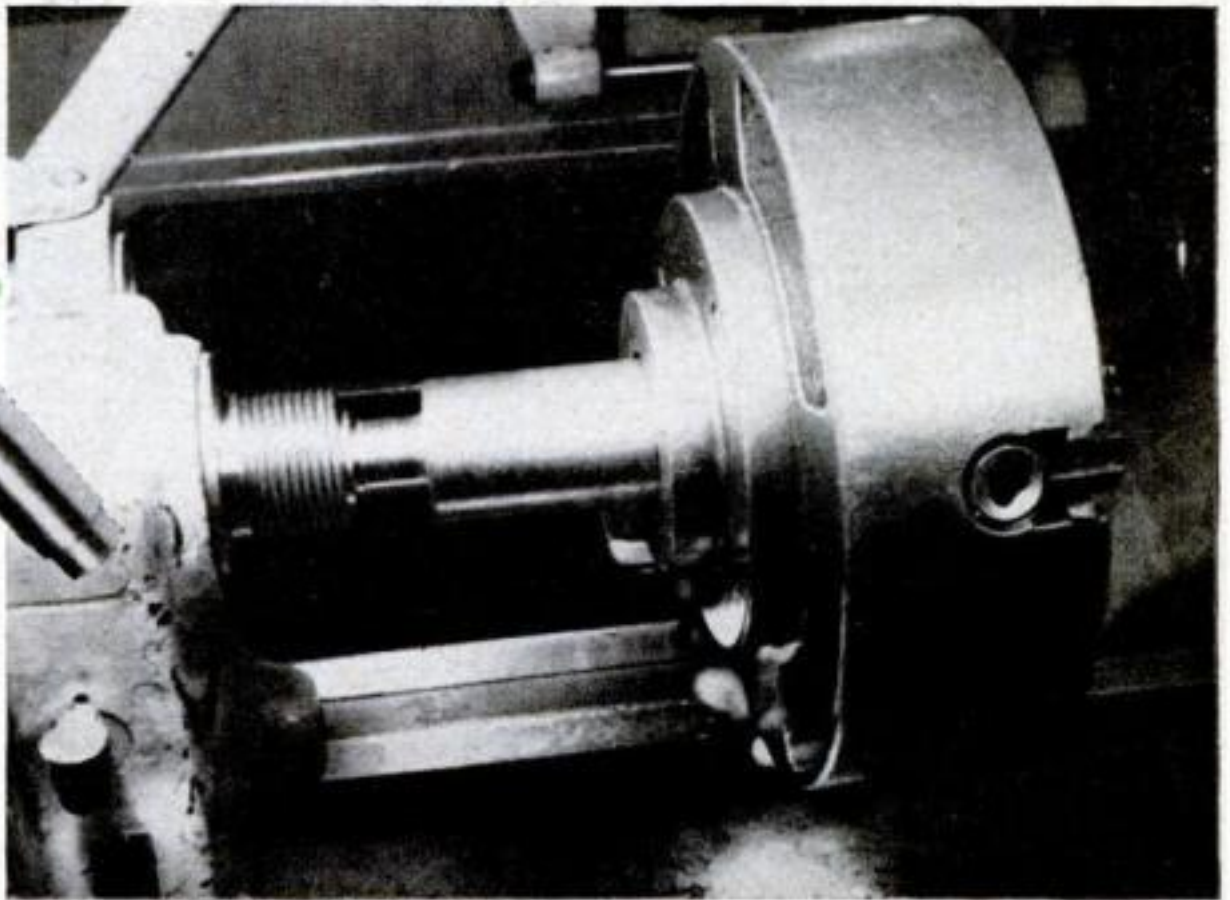
# New Shop Ideas



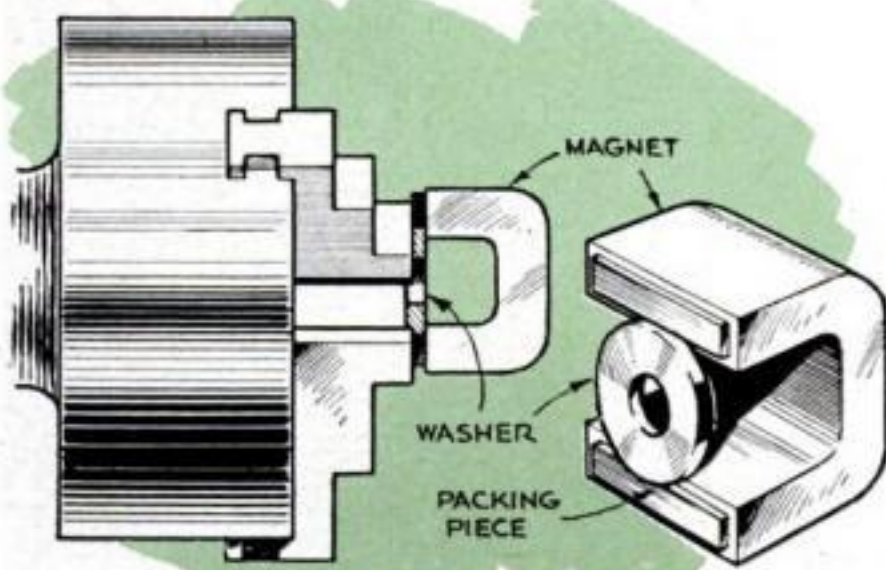
**Bar Mounts Chuck.** If its threads fail to start right, a heavy chuck may drop off the spindle, endangering fingers and the lathe ways. This aligning bar makes mounting or removing such a chuck far safer.

Centerdrill and mount a suitable length of bar stock between centers. Turn a tapered section to fit the internal taper of the lathe spindle, and a parallel part to slide easily into the back-plate hole.

Push the bar hand-tight into the spin-



dle, then slide the chuck onto the straight section (photo) and up to the spindle nose. It will be perfectly aligned and easy to thread on. To remove the chuck, first insert the bar through the opened jaws. —H. J. Gerber, Stillwater, Okla.



**Magnet Helps Chuck Washers.** The hardest part of boring or facing a disk is chucking it so that the face runs true. A horseshoe magnet with flat-ground pole faces makes this much easier.

Place the washer on the magnet. Put the magnet on the chuck jaws with the washer inside them, tighten the chuck, and remove the magnet. If the work is to protrude for facing, put packing pieces on the pole faces. When chucked, work will protrude by the thickness of these pieces.—C. T. Bower, London, England.



**Salvaging Bandsaw Blade.** When a few teeth are stripped from a metal-cutting bandsaw blade, the teeth remaining near the stripped section catch in the work. Soon more teeth are stripped off.

The blade can be saved for further use by grinding off the stripped section and tapering it back into the teeth at both ends. With a flexible shaft or a hand grinder, this can be done right on the saw.—J. C. Magee, Schenectady, N.Y.

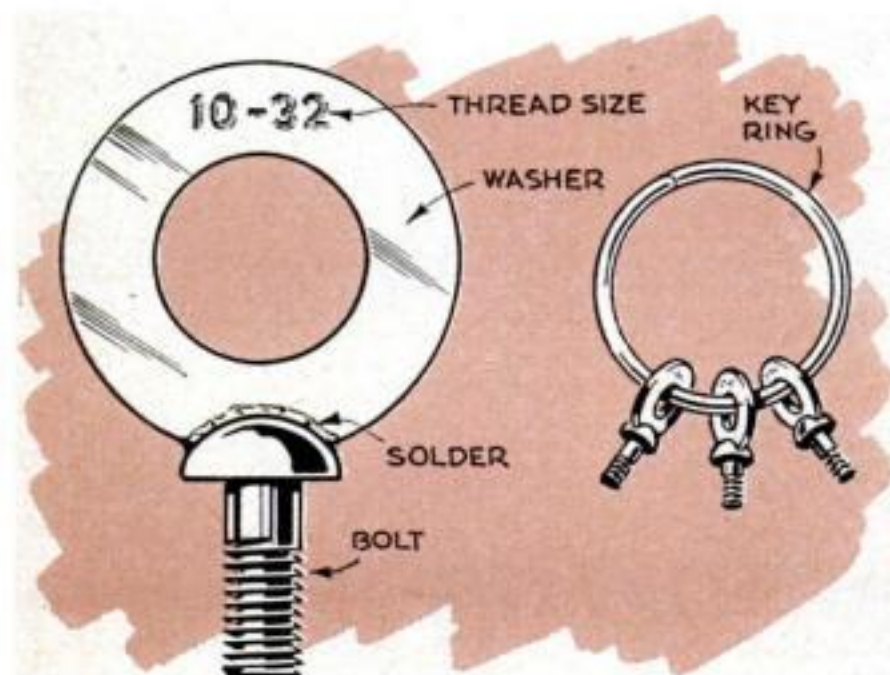
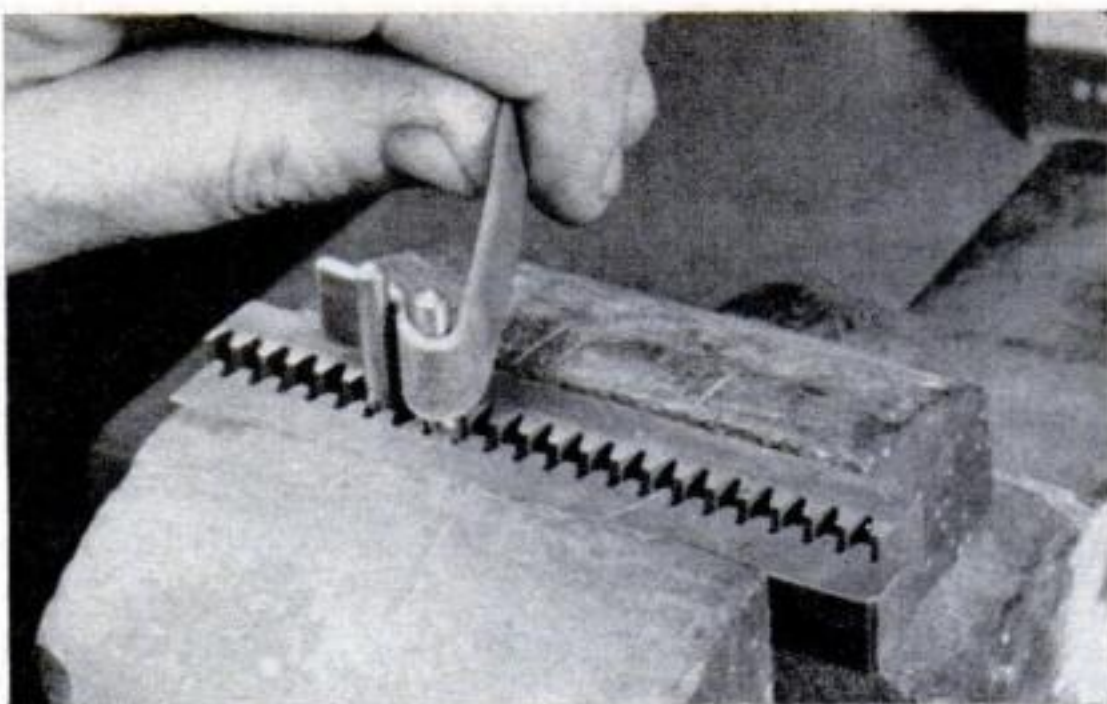
Please turn the page for more shop tips

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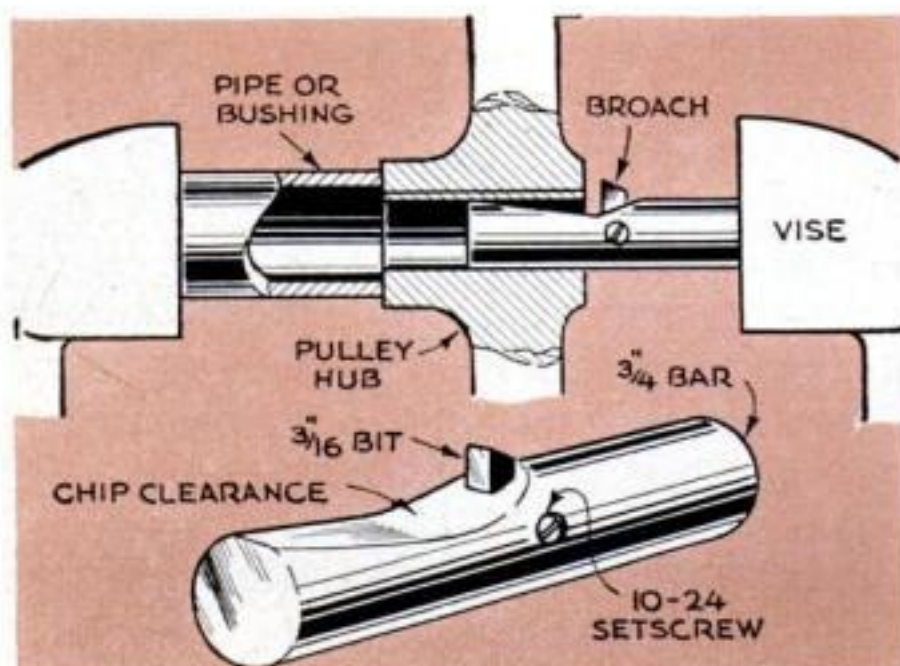
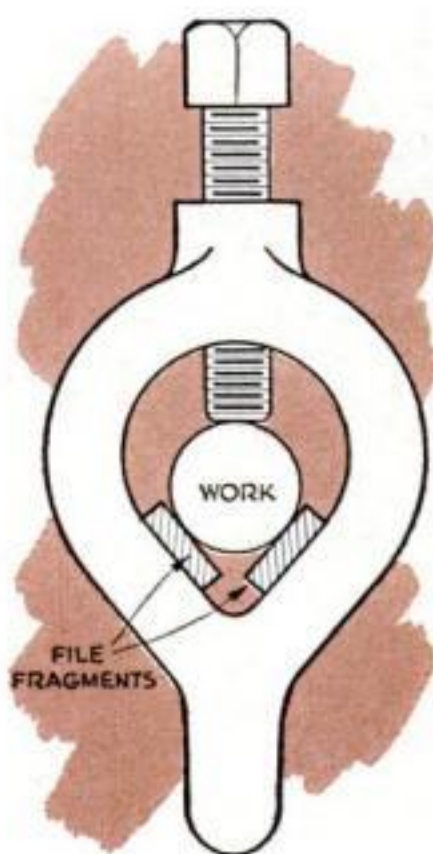
## More Shop Tips

**Rack Forms Bending Jig.** Two short sections of gear rack and a couple of steel pins make a useful jig for shaping light wire or strip by hand. Clamp the pins between tooth gaps as in the photo at right, spacing them one or more teeth apart as the thickness of the stock and the desired bending radius of your work require.



**Key-Ring Nut Gauge.** For quick identification of nuts or tapped holes, solder washers into the slots of several different roundhead bolts as shown above. Stamp the bolt diameter and the thread pitch on the washer. String the washers on a key ring to keep them conveniently together.  
—Hugh Lineback, Stillwater, Okla.

**Better Bite for Lathe Dog.** For some jobs—thread cutting, for instance—it is important to prevent work from slipping in a lathe dog. Two fragments of a broken file, inserted as shown at right, will increase the grip of the dog enormously.—Federico Strasser, Santiago, Chile.



**Broach Cuts Internal Keyway.** Two pulleys with hubs  $1\frac{1}{2}$ " thick required keyways. Having no machine tools, I made a broach from a 4" length of  $\frac{3}{4}$ " bar that was a sliding fit in the hub bore. A hole drilled in the middle was filed square for a  $\frac{3}{16}$ " lathe bit. This was ground square across, without rake, and held by a recessed setscrew. In front of the bit, the bar was cut away for chip clearance.

With the bit set to remove  $\frac{1}{32}$ " of stock, the broach was pressed through in a vise. The bit was then reset and another pass made, care being taken to start the tool in line with the previous cut. It took only 10 minutes to cut each keyway.—William B. Goodrich, Somerville, Mass.

▶▶▶ If a sharp tool drops through the hole in my drill-press table, it lands on a square of 1" wood instead of banging against the base of the drill. The keen edge is unharmed. The wood piece has cleats on its underside to fit slots in the base.—F. W. Marshall, Haverhill, Mass.



## Accordion-Action Air Pump Inflates Back-Yard Wading Pool

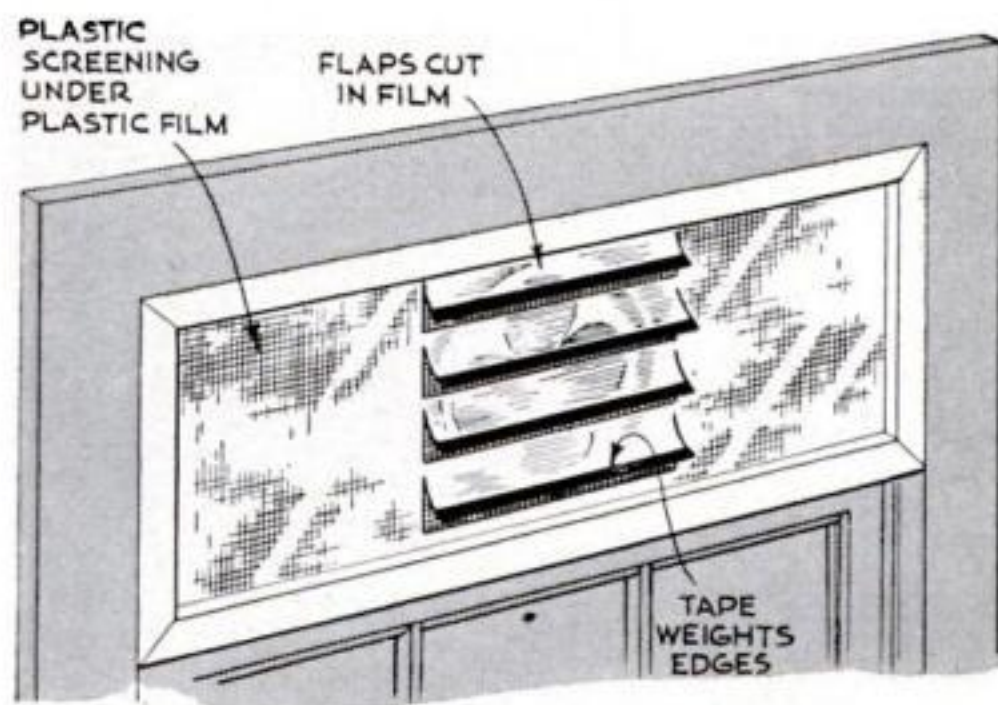
You can inflate a wading pool with this little pump, or take it to the beach to pump up plastic playthings. It is made from 8" of inner tubing and two wooden disks that fit into the ends.

Cut the disks from  $\frac{1}{2}$ " stock. In one disk bore five  $\frac{1}{2}$ " holes: one to take a piece of metal tubing and four close together to serve as an air valve when covered inside with a rubber flap.

Have your plumbing-supply dealer thread one end of the metal tubing to take two nuts that will hold it to the wooden disk, as in the drawing. Groove the edges of both disks, apply cement and bind the inner tube on with wire. Insert a length of rubber tube between the tubing and the pool inlet valve, and pump—like playing an accordion.—*Morgan Upton, San Francisco.*



## Plastic Louvers That You Can Make Will Rainproof a Window Fan



If you don't want to buy expensive automatic louvers to keep rain from coming in at a window fan, you can make your own from plastic film and plastic window screening.

Tape the screening over the fan's metal frame. Then tape clear-plastic film over the screening. Cut flaps  $3\frac{1}{2}$ " deep in the film and apply electrician's plastic tape to the bottom edges so that it overhangs by half its width. Powder the overhang to keep it from sticking. When the fan is on, the flaps fly out; off, the weight of the tape closes the flaps and the overhangs seal the openings raintight. The screening prevents the flaps from blowing into the blades.—*Robert Hare, Barberton, Ohio.*

▶▶▶ You don't need to buy wire mesh or reinforcing bars to lay a concrete walk. Use wire coat hangers. Weave them together or tie with wire, set them on a first pouring of concrete, and cover with a second pouring. The wire is heavy enough for use in slabs of moderate size and, being enameled, will resist rust.—*George Walton, Sharonville, Ohio.*



# New Box Cameras



## Make Hard Shots Easy

By Sheldon M. Gallager  
PSM PHOTOS BY W. W. MORRIS

**Want to shoot "natural-light" scenes like this? The secret: A flashbulb and a \$10 Brownie**

**A**LL of a sudden, box cameras have gone highbrow. For \$8 to \$20, you can get compact streamlined models that won't even let you make a double exposure by mistake.

You can shoot eye-catching portraits by simply slipping on an inexpensive close-up lens. Stick on a sky filter and you get dramatic cloud effects.

Instead of waiting for just the right light, you make your own. The "natural-light" picture of the kids on the oppo-

site page was actually made with a flashbulb, dimmed down with a handkerchief over the reflector so that it wouldn't wash out the outdoor light.

Today, nearly all box cameras have built-in flash. Some even have extension outlets so that you can use multiple flash and bounce lighting. By rigging up your own extensions, you can create many special effects normally possible only with expensive cameras.

*New flashbulbs, too.* GE's new pea-

**Fill-in flash lets you take better pictures in shade**



ACTUAL  
SIZE

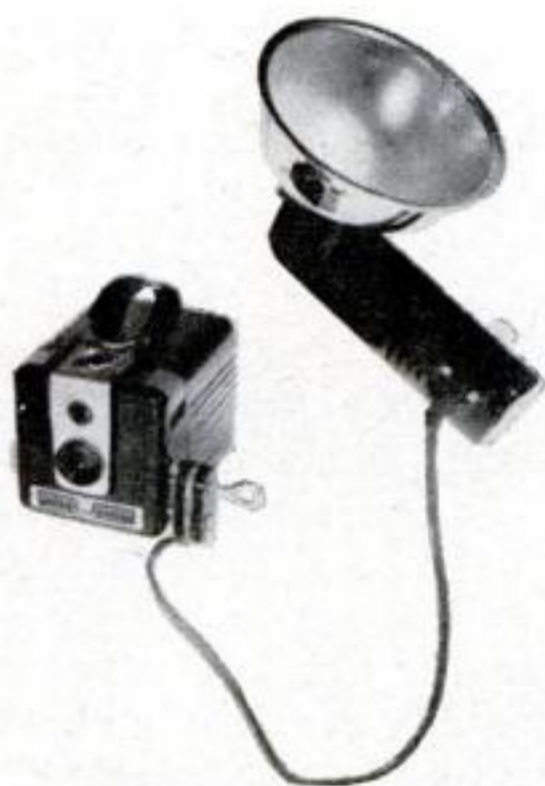


**FLASHBULB USED OUTDOORS** eliminates shadows where sunlight can't reach even on a bright day. Boy in tree is almost blacked out above, but becomes visible when you add a flash as shown at right. You can use flash on dull days, too, when the natural light is not bright enough. The tiny flashbulb at the left above is General Electric's new M-2.





### ***Bounce light gives you shots like this***



**FIRESIDE SCENES ARE TOUGH TO TAKE** because a direct flash gives too much light and kills effect of fire, while no flash at all leaves scene too dark (left below). Trick here is to bounce flash off ceiling or a wall to give just a little light. To remove the flashgun, connect a lamp cord to socket terminals on camera with screws or nails filed down to a snug plug fit (several models take #10-24 machine screws). Tape other ends of cord to contacts on the flashgun. Set camera on "bulb" and rest it on a firm surface. Press the shutter, then let go immediately—about a half-second.





## Portrait attachments let you take close-ups like this



**INEXPENSIVE CLOSE-UP LENSES** that slip over the camera's regular lens make possible shots at about 3½ feet. When you are making portraits outdoors, face your subject *away* from the sun so that the harsh glare won't produce a strained, squint-eyed expression. This uses the sun as a dramatic backlight, highlighting hair and shoulders, but puts the face in shade, as

shown at left above. To get rid of the shadows, you can now use a flash to illuminate the face without spoiling the highlights, as shown at right. Since you are working up close, drape one or two thicknesses of white handkerchief over the flash reflector (top left) to reduce the light, or remove the flash and have someone hold it about six feet away from the subject.

nut-sized M-2 flashbulbs give you nearly as much light as older, large bulbs, yet cost much less. You can slip a carton—enough for a whole roll of film—into a coat pocket without making a bulge.

The bulbs are also available in a blue tint to match the blue skylight when you use flash on outdoor color shots.

By using flash outdoors, you don't have to face your subject smack at the sun. With the sun to one side, you keep it out of your subject's eyes and increase the modeling. The flash provides just enough light to soften the shadows.

Those old flat, front-lighted indoor shots are on the way out, too. By combining fill-in flash with other light sources, you can create the impression that light is coming from a window,

reading lamp, fireplace or TV set, instead of directly from the camera.

**Where to place the flash.** All box cameras have a fixed lens opening—usually f/11—and a fixed shutter speed—usually between 1/30 and 1/50 second. You can't change this exposure setting, but you *can* adapt it to many shooting conditions by choosing the right lighting.

Each package of film or flashbulbs is marked with a "flash factor number." For an adjustable camera, you use this factor to get the lens opening required for the flash-to-subject distance.

With a fixed-exposure box camera, you can work the trick backwards. Since you know that your lens opening is always f/11, you can divide this number into the flash factor and find out how far





**FLASH EXTENSION**, hidden near fire, illuminates picnickers in top photo as if by firelight. Without flash, fire alone does not give enough light (inset). You can make your own flash extension with a reflector clamped to an ordinary lamp socket (left). A screw-base adapter takes midget flashbulbs and can be fitted with a smaller adapter to take tiny M-2 bulbs.

away to place your camera and flash.

If you want to shoot closer than the correct distance, you know that you will have to cut down the light—either by covering the reflector with a handkerchief or by removing the flashgun and holding it farther back.

**What film to use?** The speed of a film is a measure of the amount of light that it needs to take a picture. Selecting film with the right speed is another way to adapt the box camera's fixed exposure to varying light conditions.

Today's Verichrome-Pan and All-Weather Pan are twice as fast as the older films that most amateurs used. They are fine for average-to-bright outdoor scenes and for flash shots at distances of six to 15 feet.

For poorly lighted scenes where flash won't reach, such as long-distance shots on dark days or in deep woods, you can load up with superfast Tri-X or Super Pan Press, which thrive on very little light. But use them sparingly. For normal scenes and flash shots, they may give you overexposures.

**Color, too.** The new Kodacolor film—twice as fast as the old type—turns out good color prints with only average light outdoors or a midget flashbulb indoors. Standard prints are jumbo size—two to three times as big as the negative.

Kodacolor is also the first color film that can be used indoors or out without conversion filters. For flash shots, you just use clear bulbs inside or at night and the blue-tinted ones in the sun. **END**



# How to Install a Wrap-Around Windshield on Your Boat



**1 KIT CONTAINS ALL PARTS**, including plastic, which should be laid out on a covered bench to protect it from scratches. Be sure that the kit you buy is the right size for your boat.



**2 RUBBER Mallet** is used by Walt Switzer of Cincinnati to force edge strip over the top of the windshield. It sticks itself in place. Switzer has installed dozens of these kits.



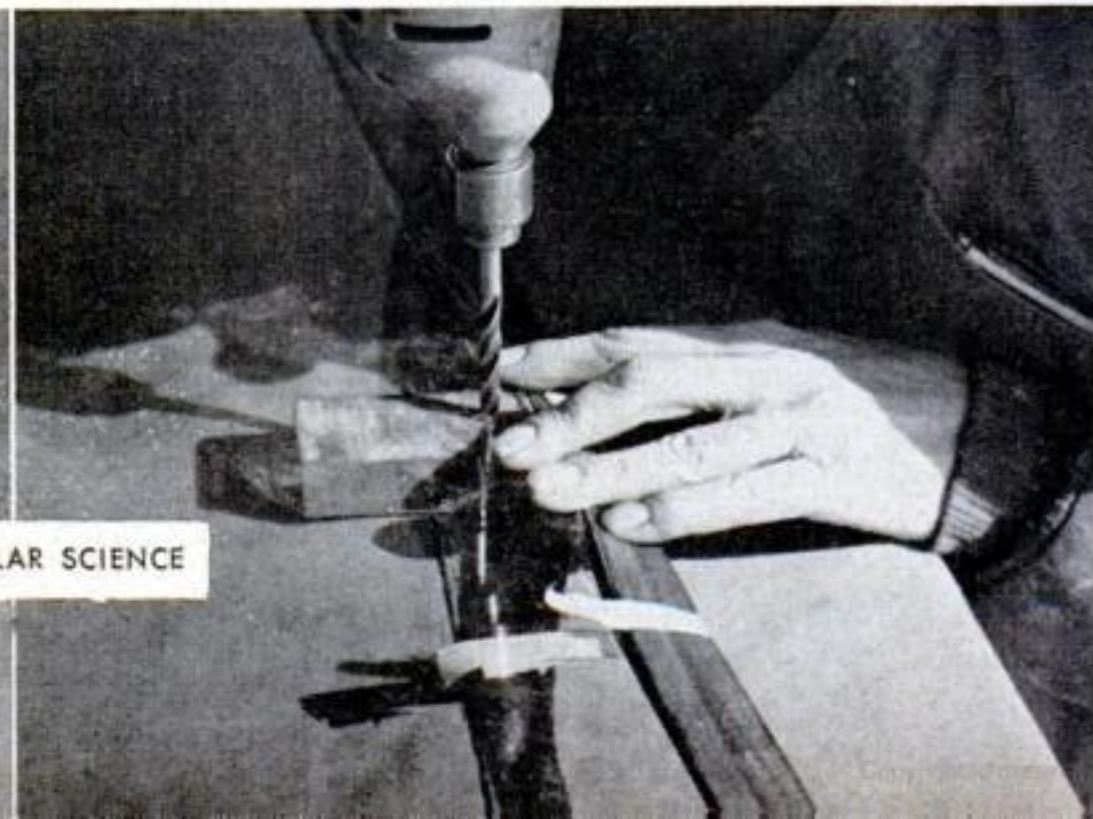
**3 BOTTOM EDGE** of windshield is covered with rubber molding, which is held in place temporarily with tape. Leave enough overlap at ends to go under wings, which are installed last.



**4 TWO CENTER SUPPORT BRACKETS** are screwed 10" forward of cockpit, 7" on either side of boat centerline. Other brackets are then installed at 14" intervals toward sides of boat.

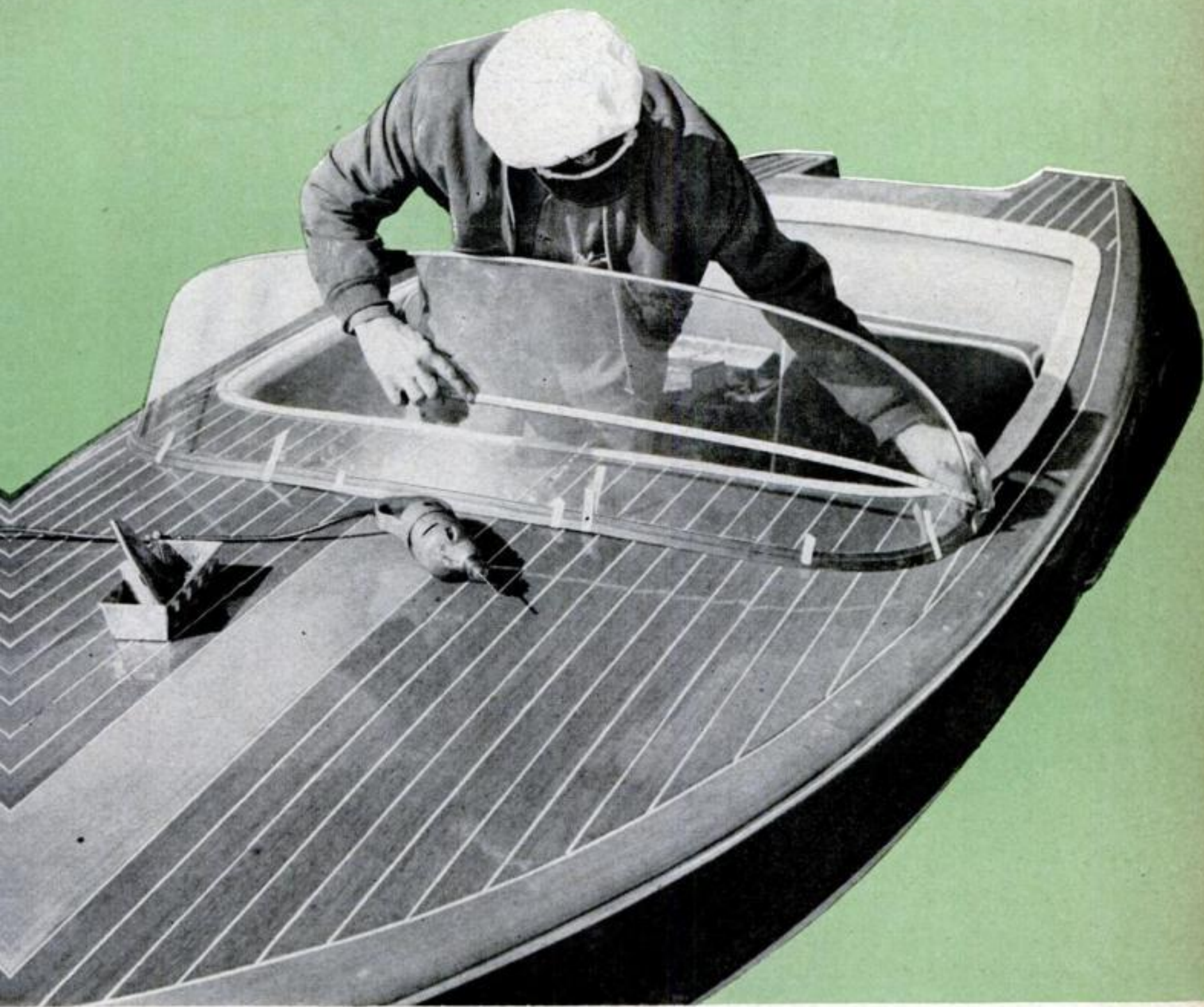
**6 HOLES FOR SUPPORT BOLTS** are marked with windshield carefully held in position against the brackets. Switzer tapes the approximate location, then marks drilling points on tape.

**7 DRILLING PLASTIC** requires drill with sharp 60° point and a wood block underneath. Rubber molding is pushed aside to get the center of the hole  $\frac{5}{8}$ " from edge of windshield.





**An experienced boatbuilder shows you how to finish the job in one afternoon, using curved plastic and hardware from a kit.**

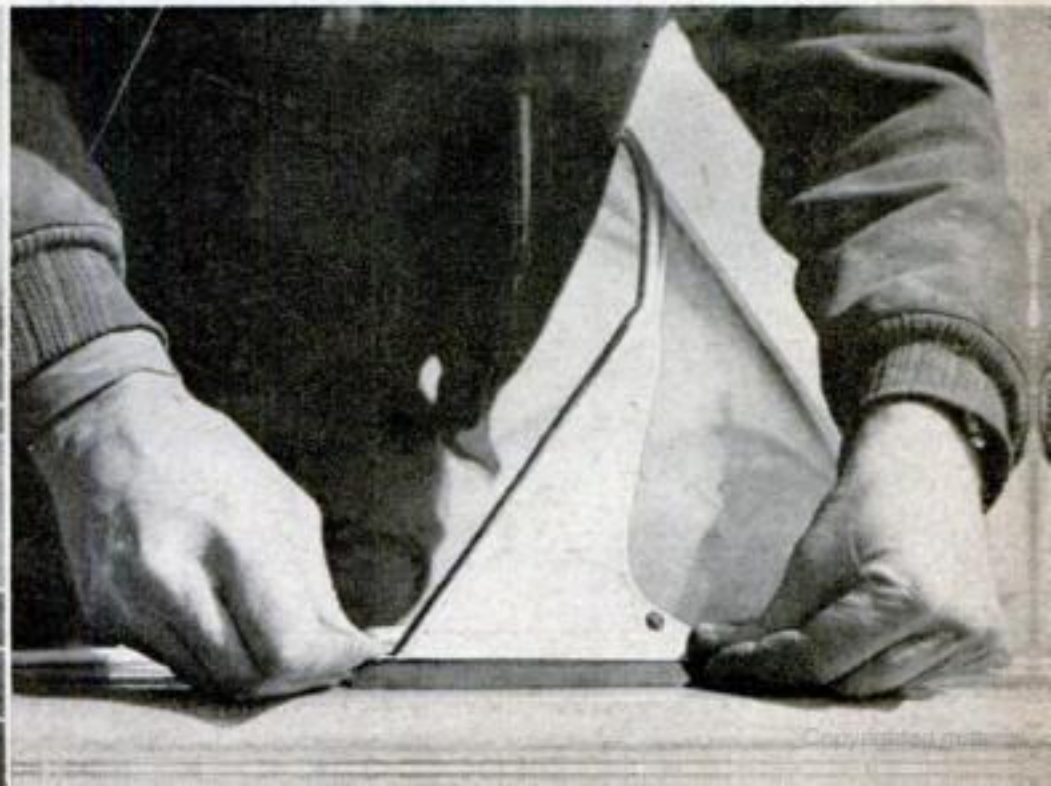
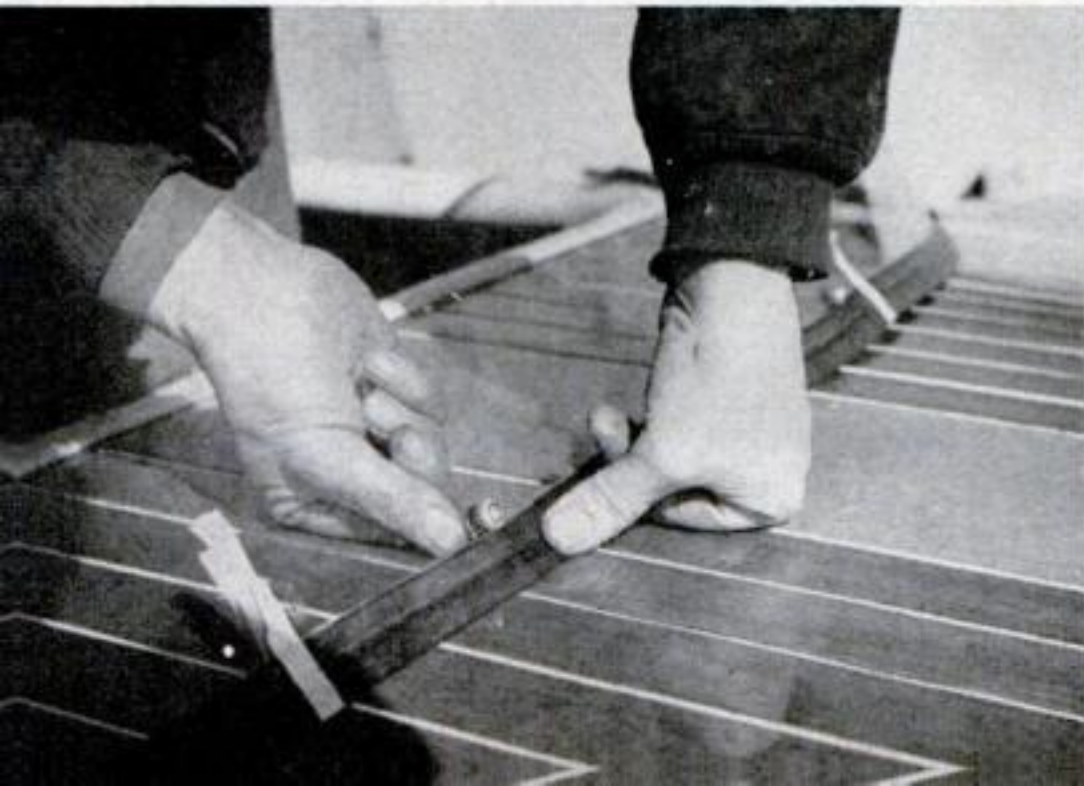


**5 CENTER OF THE WINDSHIELD** must coincide with the center of the boat. Here Switzer carefully measures the plastic, which can be marked with a grease pencil. This mark is then

aligned with the boat centerline, which was previously marked for installation of the support brackets. The wrap-around windshield kit is made by Nelson Taylor Co., Gloversville, N. Y.

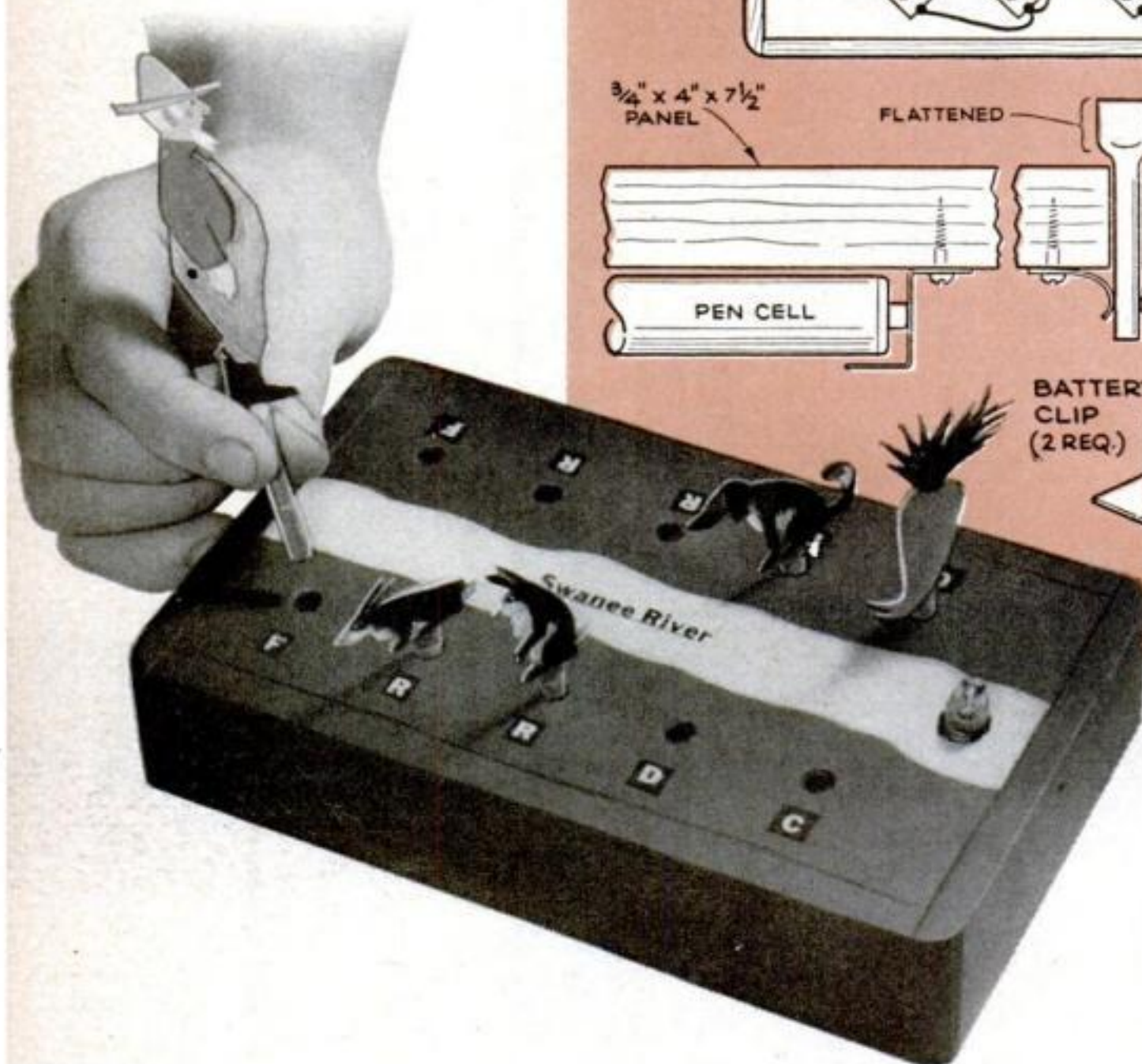
**8 RUBBER GROMMETS** fit into the holes and protect the plastic from bolts that fasten it to supports. All bolts except ones that fasten ends of the windshield can be installed now.

**9 CHROME WINGS** are attached to the ends of windshield. The windshield can then be bolted to the end brackets. Remove the strips of tape—and the job is done.—*George Laycock.*

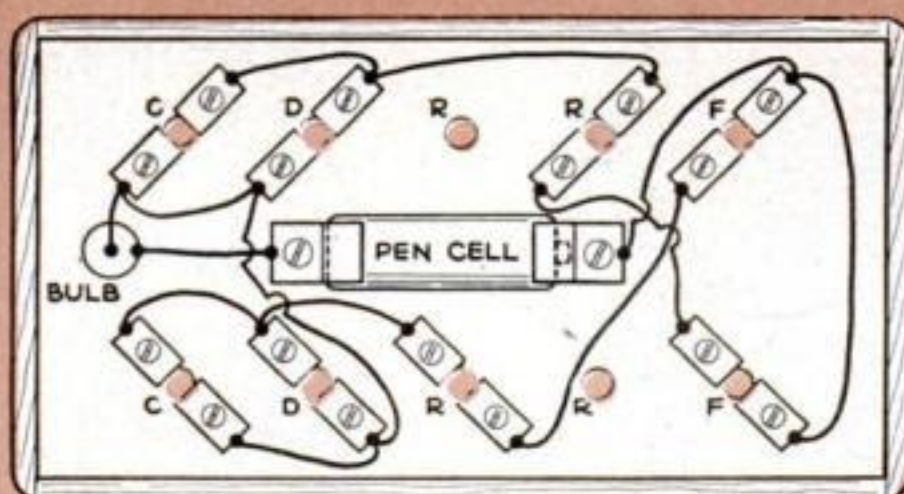




# Electric Game Challenges Puzzle Fans



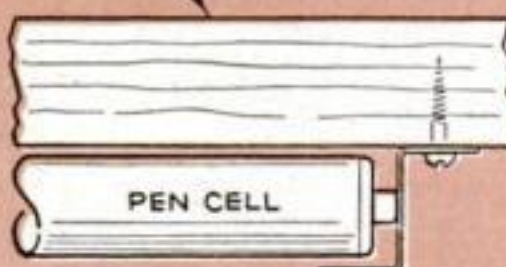
PUZZLE WIRING (BOTTOM VIEW)



$\frac{3}{4}$ " x 4" x  $7\frac{1}{2}$ " PANEL

FLATTENED

$1\frac{1}{2}$ -VOLT FLASHLIGHT BULB



PEN CELL

BATTERY CLIP (2 REQ.)

WIRES SOLDERED DIRECTLY TO BULB

FRAME

CONTACT STRIP (16 REQ.)

**MAKE A WRONG MOVE,** and the bulb lights. Pegs must be moved to holes directly opposite in a definite order to solve the puzzle. If an error is signaled, all pegs should be returned to the starting position.

**E**VEN tots can understand the problem posed by this electric puzzle, yet it is tricky enough to fool overconfident grownups on the first try.

The problem is that of the farmer who has to cross a stream with a dog, a pair of rabbits, and a sack of carrots. In his small boat, he can row only the dog, or the two rabbits, or the carrots across at one time. He may cross alone, but must never leave the dog with the rabbits, or the bunnies with the carrots.

Obviously the farmer must cross each time, and the two rabbits must always be moved as one. If a mistake is made, the bulb will light.

**How to make the game.** Cut a round curtain rod or small tubing into five 2"

lengths. Squeeze one end of each flat. Drill holes in a  $\frac{3}{8}$ " board to fit these pegs. Punch holes in  $\frac{1}{4}$ " strips of tin-can stock and bend as shown. Mount two under each hole so that an inserted peg will touch both. Make two clips to hold a pencil-size flashlight cell. File a hole at one end of the board to take the bulb.

Solder wires directly to the bulb and the contacts. Nail a shallow frame under the panel to enclose the wiring. Trace cartoon or story-book figures on light cardboard and glue them to the pegs.

**Solution.** Farmer takes rabbits across, returns alone, takes carrots across and brings rabbits back. Leaving them, he ferries dog across, then returns for rabbits.—Matthew Mandl, Yardley, Pa.



# Midget Transistor Superhet

**Gives  
Big-Set  
Performance**

**By  
Howard G. McEntee**

**LIKE A HOME RADIO**, this midget tunes cleanly, without howl, whistle or background hiss, and so sharply that you can get weak stations close to strong ones. In good signal areas, the set will work on a mere wisp of antenna.

**T**HIS pocket radio has real power and is as easy to tune and free of noise as the set in your home or car. That's news because, until now, miniature radios have been weak, apt to howl and hard to tune.

A real midget, this one is housed in a 1"-by-2"-by-3" box, including the battery. Its super-performance comes from three transistors combined in the same kind of superheterodyne circuit that you find in a full-size radio.

The use of this circuit represents a big forward step. Most previous miniature radios were basically primitive crystal sets with an amplifier tacked on. They needed a long antenna, could pick up only powerful nearby stations, and then

got two or three at once. Some had tuned radio-frequency amplifiers (TRF) to help separate the stations. These amplify the signal at the same frequency at which it reaches the receiving antenna. But such comparatively high frequencies resist amplification, and thus the set's sensitivity to weak stations is limited.

To improve sensitivity, midgets generally used regeneration. This feeds part of the amplified signal back through the amplifier again. But it makes tuning finicky: A slight misadjustment splits your ear with whistles and howls.

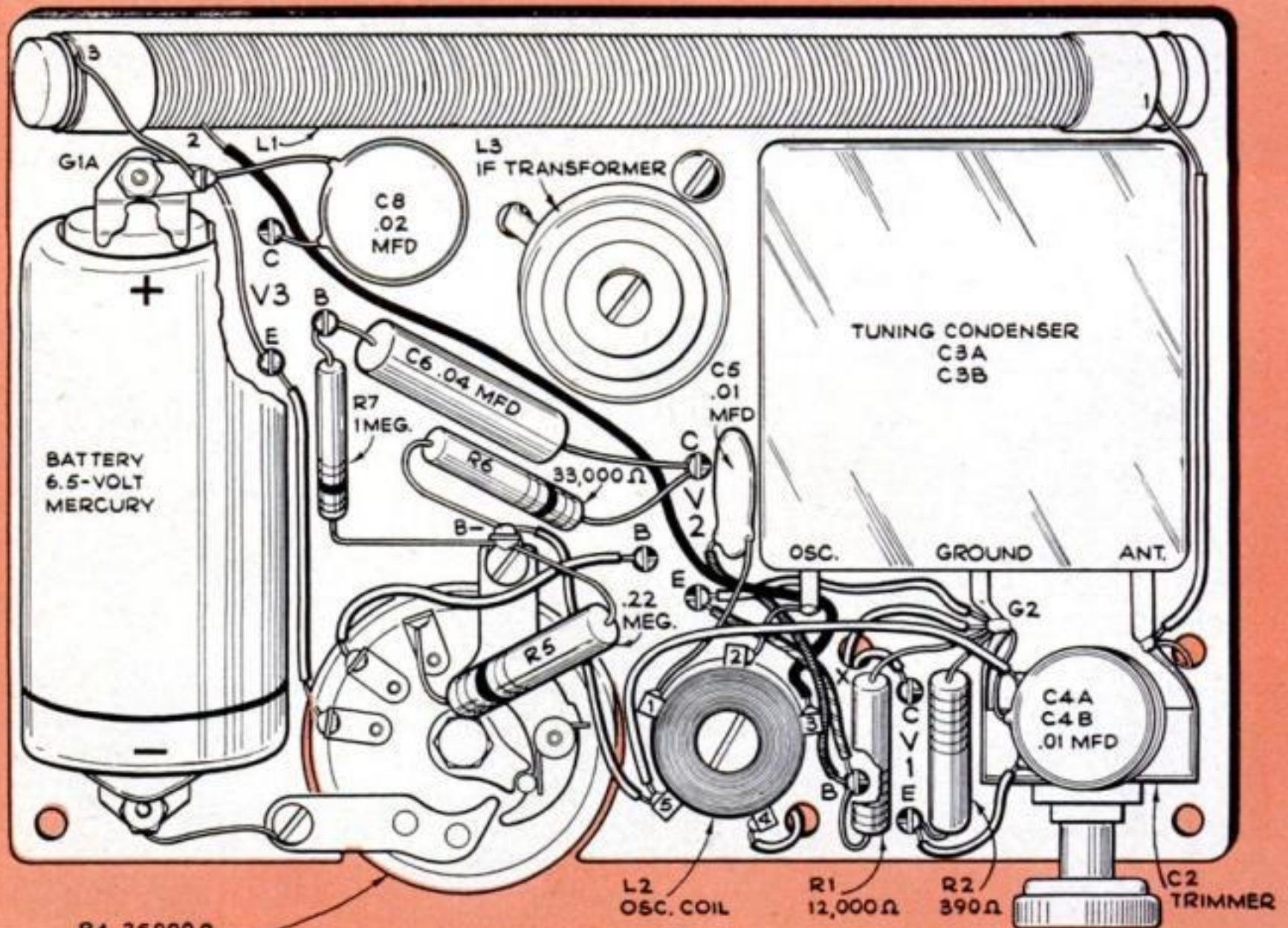
All these ideas—crystals, TRF and regeneration—were long ago discarded by designers of home radios in favor of the

*[Text continued on page 200]*

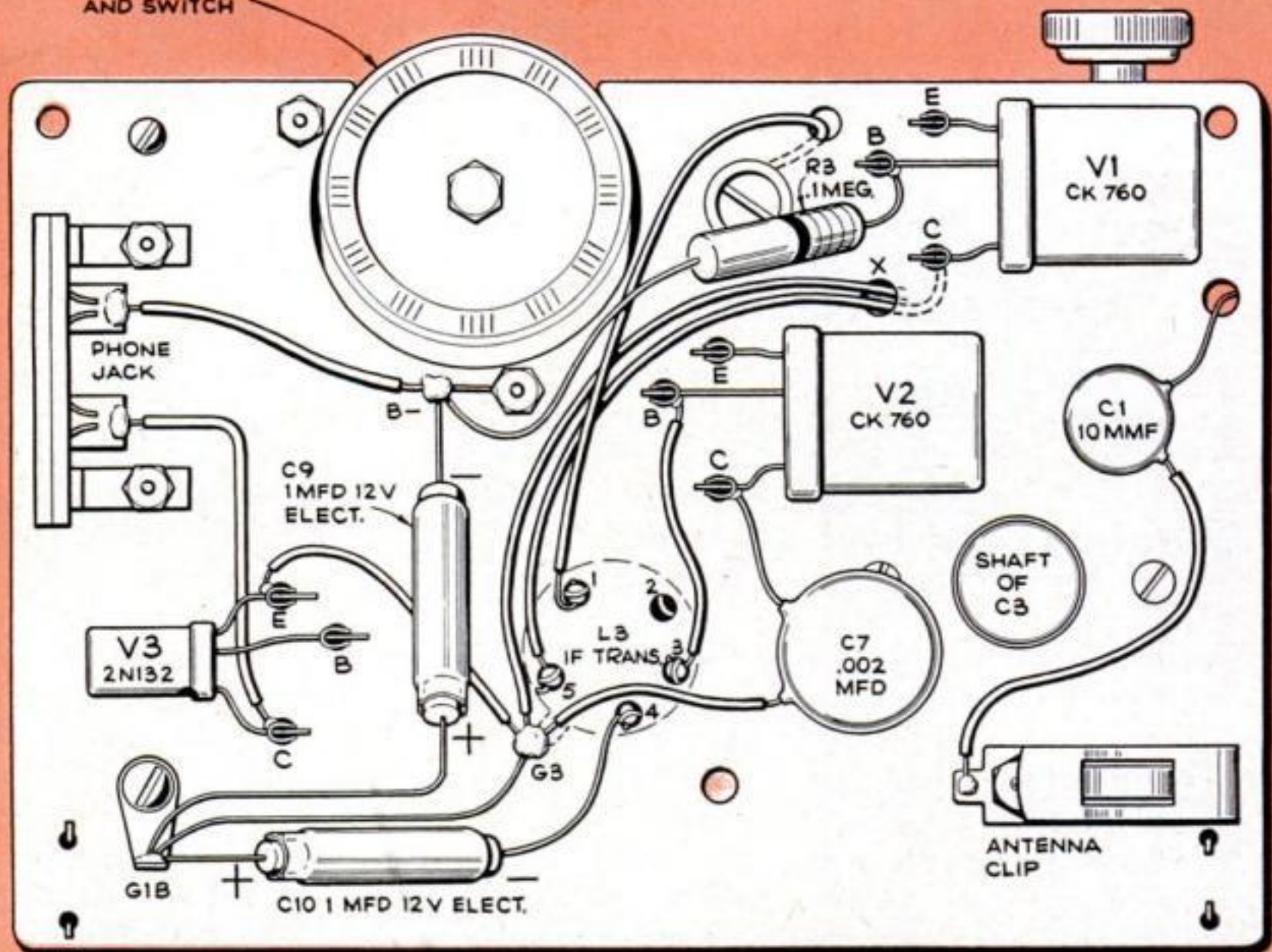
**For diagrams and photos of the midget radio, see pages 198-199** AUGUST 1956 **197**



## BOTTOM OF CHASSIS

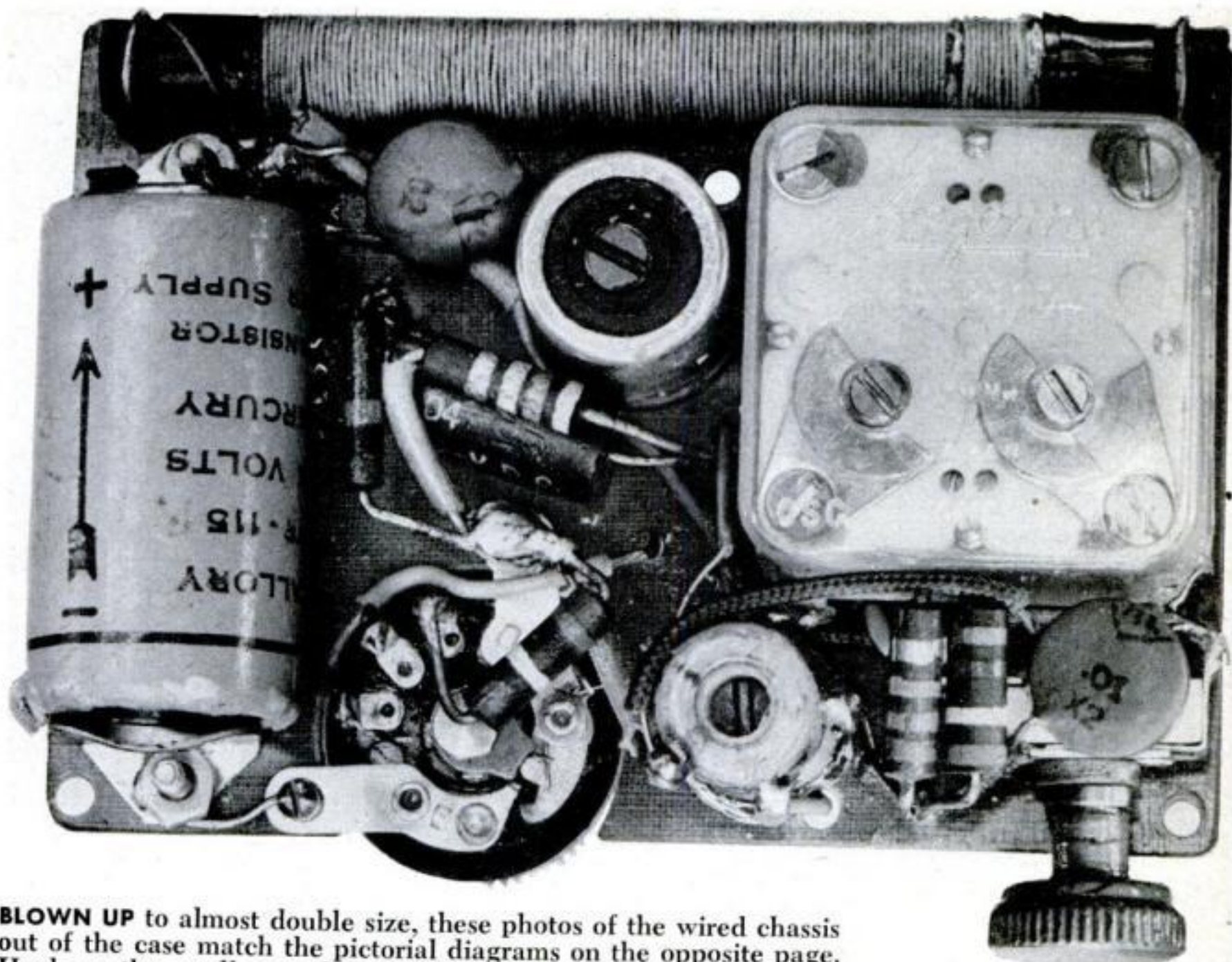


R4 25,000  $\Omega$   
VOLUME CONTROL  
AND SWITCH

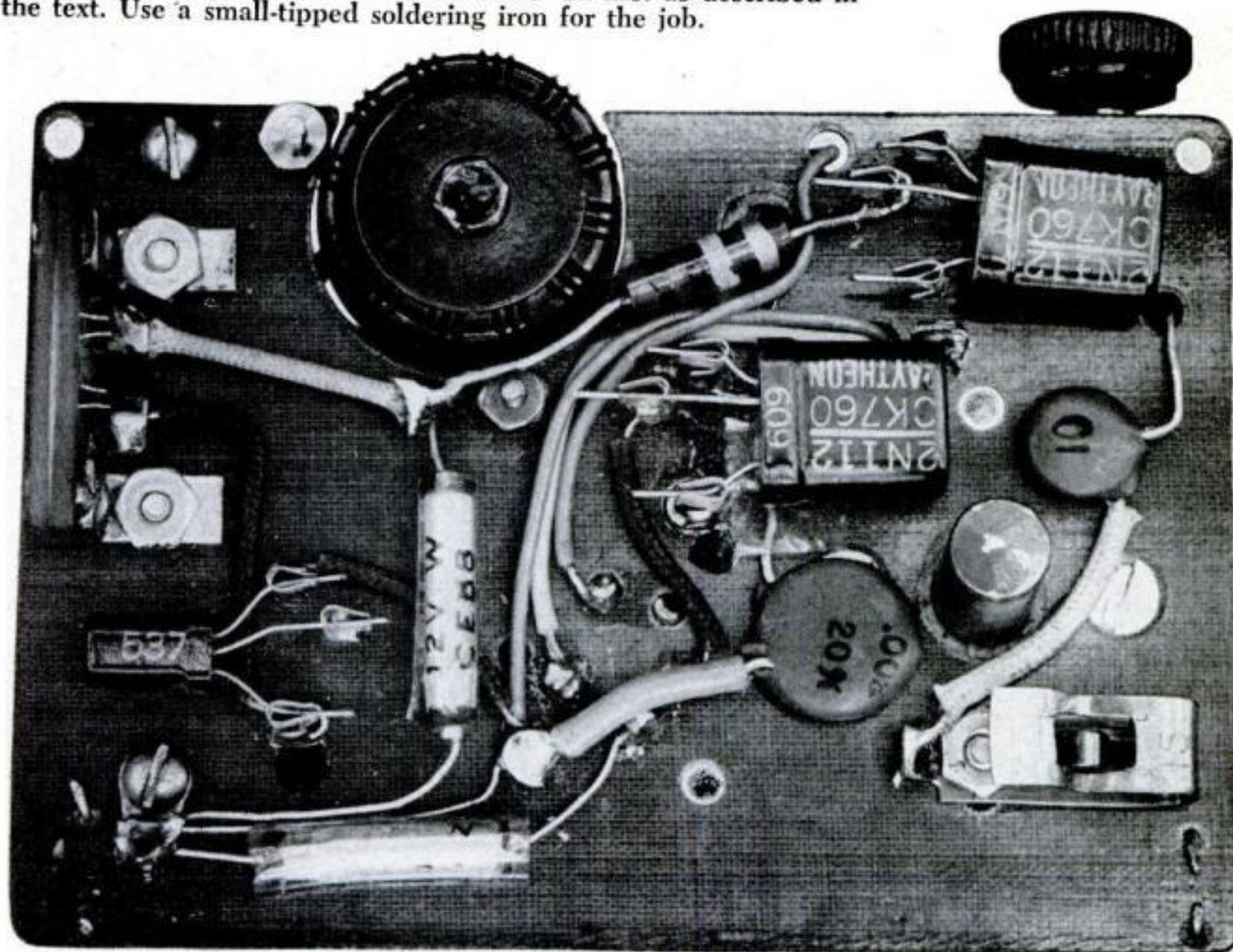


## TOP OF CHASSIS





**BLOWN UP** to almost double size, these photos of the wired chassis out of the case match the pictorial diagrams on the opposite page. Hook up the small parts between L2 and C2 first as described in the text. Use a small-tipped soldering iron for the job.





superhet circuit. The superhet generates a radio frequency of its own in a local oscillator. This is mixed with the incoming signal so that the result is a signal of intermediate frequency (IF). This IF is fixed, and is always lower in frequency than the incoming signal. Being lower, it is readily amplified. You can tune easily and separate stations.

By using three transistors, two of which do double duty, this quality circuit has been squeezed into the new PSM midget. A single transistor (V1) functions as both oscillator and mixer. The resulting IF (445 kilocycles) goes through IF transformer L3 to the detector transistor V2. This detector strips off the sound part of the carrier wave and amplifies it. The third transistor (V3) further amplifies this sound signal, giving more than ample earphone volume.

Miniaturized parts for the midget are available by mail.\* Some of them are

\*Lafayette Radio, 100 Sixth Ave., New York 13, N.Y.

especially made for transistor circuits.

**Winding the coil.** L1 must be hand-wound of Litz wire on a special iron core cut  $2\frac{3}{4}$ " long. Tape the wire  $\frac{3}{8}$ " from one end, wind six turns, and twist a  $\frac{1}{4}$ " loop for the tap at terminal 2. Then wind a total of 115 turns and tape the end fast. Winding is best done with the core chucked and spun in a hand drill clamped in a vise.

**Mounting the parts.** Fasten L1 on the underside of the panel with U-shaped clips of copper wire, bending the ends on top. Make battery clips from stiff brass or tin plate and bolt them on.

The transistors are mounted in flea clips—tiny beryllium-copper clips. Simply press these into No. 52 holes. Spot those marked C (collector) with red.

Next, mount the tuning condenser C3, IF transformer L3, phone jack, antenna clip and volume control. Do not mount oscillator coil L2 or trimmer C2 as yet.

**First wiring steps.** Cut a piece of

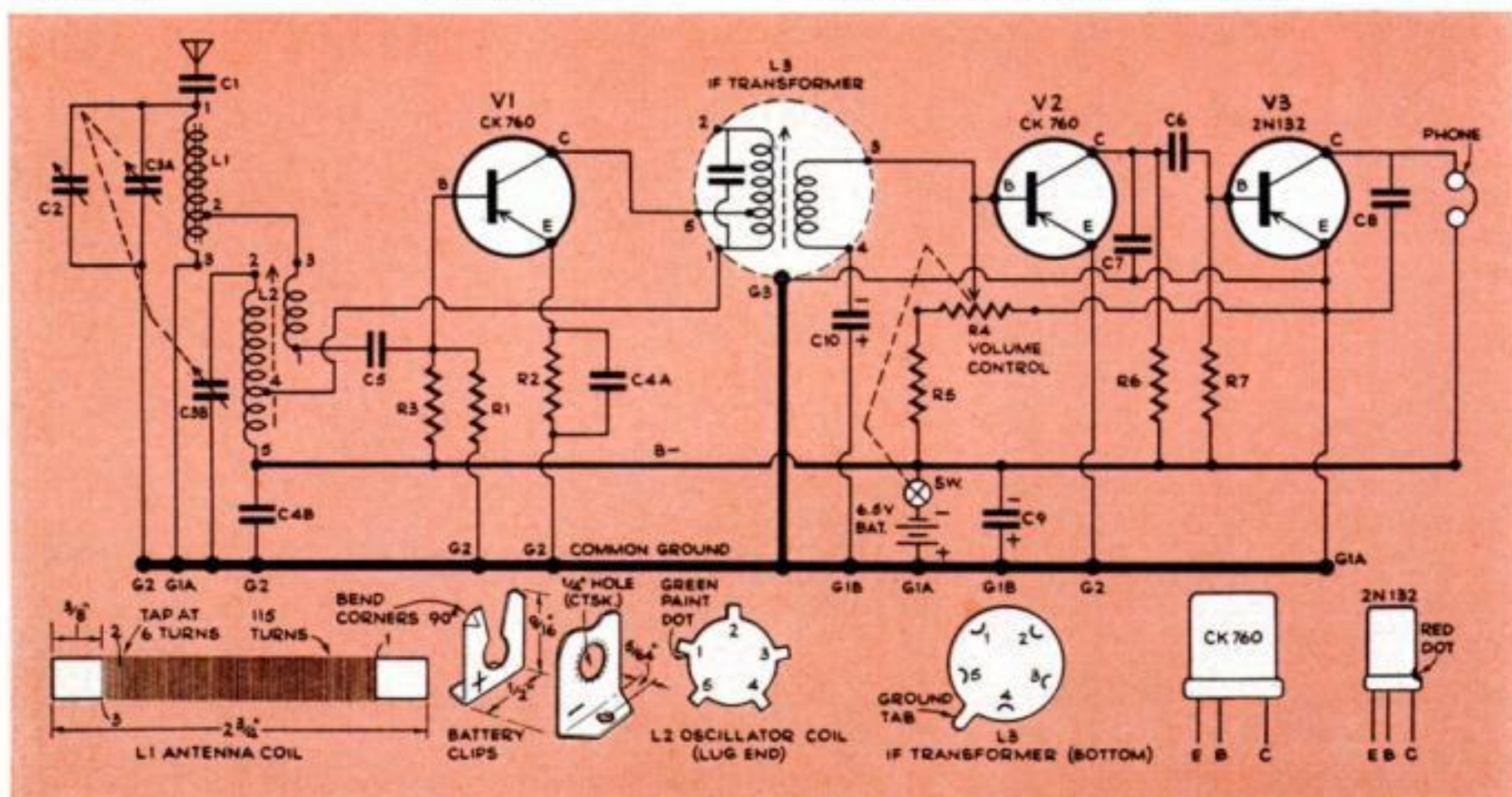
#### PARTS LIST

L1: Antenna coil;  $8\frac{1}{2}$ " Litz wire on  $\frac{1}{4}$ "-by- $2\frac{3}{4}$ " ferrite core.  
L2: Oscillator coil (Lafayette MS-265)  
L3: 455 kc. IF transformer, with built-in condenser (Lafayette MS-188)  
C1: 10 mmfd. ceramic disk (CRL type DD)  
C2: 1.5 to 20 mmfd. trimmer (Arco 402)

C3: two-gang superhet tuning condenser (Lafayette MS-270)  
C4: double .01 mfd. ceramic (CRL type DDM-2)  
C5: .01 mfd. ceramic  
C6: .04 mfd., 200 volt paper (Aerovox P83Z)  
C7: .002 mfd. ceramic disk (CRL type DD)  
C8: .02 mfd. ceramic disk (CRL type DD)

R1: 12,000 ohm,  $\frac{1}{4}$ -watt  
R2: 390 ohm,  $\frac{1}{4}$ -watt  
R3: .1 megohm,  $\frac{1}{4}$ -watt  
R4: 25 000-ohm variable, with switch (Lafayette VC-45)  
R5: .22 megohm,  $\frac{1}{4}$ -watt  
R6: 33,000-ohm,  $\frac{1}{4}$ -watt  
R7: 1 megohm,  $\frac{1}{4}$ -watt  
V1, V2: Raytheon CK760 (or 2N112)  
V3: Raytheon 2N132  
Phone: 3,000-ohm dynamic

(Lafayette MS-278)  
Miscellaneous: midget 2-pin phone plug and socket, 1"-by-2"-by- $2\frac{7}{8}$ " plastic case (Lafayette MS-158), 1/16"-by-2"-by- $2\frac{7}{8}$ " linen bakelite, 6.5-volt mercury battery (Mallory TR-115R), 9 flea clips (Lafayette MS-263), antenna clip, dial, metal for battery clips, decals, etc.



**TO IDENTIFY LEADS** of coils and transistors, hold them in the positions shown directly above and compare with the drawings. Key letters on the

ground line in this schematic diagram correspond to the various grounding points similarly marked in the pictorial diagrams on page 198.



# You'll never outgrow a Retina!



KODAK RETINA IIIc CAMERA — HEART OF THE GREAT RETINA SYSTEM OF PHOTOGRAPHY!

There's a wonderful feeling of confidence that goes with owning a Kodak Retina Camera. By itself, it is unsurpassed as a top-quality picture-maker. As the heart of a *complete system of photography*, its versatility is almost limitless. Whatever field of 35mm picture-making intrigues you next month . . . next year . . . you have a camera capable of helping you explore it!

Your photo dealer will gladly show you the great combination of features available *only* in a Retina. And ask him about the wonderful family of specialized Retina Photo Aids that will open the doors to a lifetime of exciting picture-taking adventures. Retina IIc Camera, *f*/2.8, \$139.50. Retina IIIc Camera, *f*/2 with built-in exposure meter (shown above), only \$190.

**Ask about small down payment, easy terms**

*Prices include Federal Tax and are subject to change without notice.*

**Eastman Kodak Company**  
Rochester 4, N. Y.

1

2

3

1. Regular view with the Retina 50mm lens that comes with the camera

2. Wide-angle view with auxiliary Retina Curtar 35mm Lens Component, \$62.50

3. Telephoto view with auxiliary Retina Longar 80mm Lens Component, \$82.50

4. Kodak Retina 35-80 Optical Finder for use with wide-angle, telephoto lenses, \$17.50

**Kodak**  
TRADE MARK



hookup wire about 2" long, pass it through the hole "X" near V1 from the top of the panel (see pictorial diagram on page 198) and solder it to the collector clip of V1 underneath. Solder the other end to lug 5 of the IF transformer L3 on top of the chassis.

Pass another 2" wire through hole "X" from the top. Solder it to ground lug G2 on the tuning condenser underneath. On top, solder it to lug G3 on L3.

Cut the leads on the 12,000-ohm resistor R1 and 390 ohm resistor R2 about  $\frac{1}{2}$ " long. Connect one of each to G2 underneath the panel. Also beneath, run a bit of wire from G2 on the tuning condenser to the emitter clip of V2.

Cut the center (common) lead of the double ceramic condenser C4  $\frac{1}{2}$ " long and connect it to G2. Now install the trimmer condenser C2, soldering its two lugs directly to G2 and the antenna lug of the tuning condenser C3.

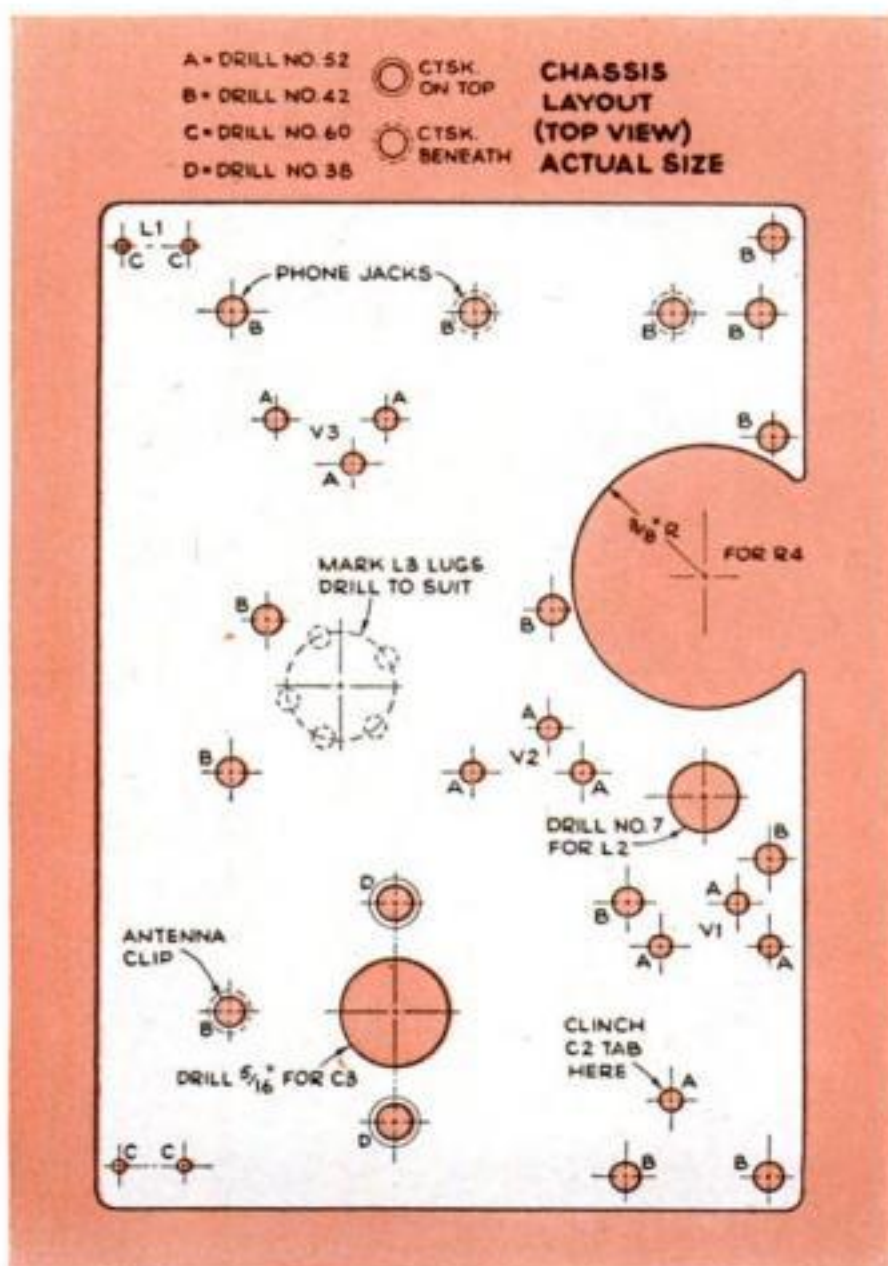
Mount the oscillator coil L2 with cement. Then solder in the remaining condensers and resistors. Note that connections are sometimes made to the same flea clip or lug bolt both on top of and beneath the panel. Don't let solder run into the part of the flea clips that takes the transistor leads. Cut these leads short and bend them to fit.

File the phone jack to  $\frac{5}{16}$ " in height. Solder the two eyelets set in it to two tiny angle brackets bent from sheet metal and fastened with bolts and nuts.

**Fitting in the chassis.** The panel is held in the case at two corners and at a point near L3. Cement bits of plastic  $\frac{5}{16}$ " high into the case, punch-mark through the panel, and tap 2-56 for screws. Cut holes in the case for the tuning shaft, control knob, phone-plug pins and antenna wire, making the latter oversize so that a small screwdriver can be inserted to tighten the knob. Notch the edges of both case halves for the shaft of C2.

File the head of a 6-32 screw flat and solder it to the C2 shaft. Then tighten a tiny knob on the threads.

The dial was made from a clear-plastic cap, the kind that snaps over the



**THIS ACTUAL-SIZE PATTERN** can be used to spot holes on the  $\frac{1}{16}$ " linen-bakelite panel. Some holes must be countersunk on the top, some beneath. Mark those for L3 from the unit itself.

center of a phone dial. Knock the bushing out of an old knob, mount it on a  $\frac{1}{4}$ " rod, and chuck in a drill to file a shallow shoulder at one end. Drill the plastic cap to a tight fit on this and cement it.

To protect the transistors, be sure to check every connection, the polarity of electrolytic condensers, and battery position before turning on the switch.

**Aligning the circuit.** The two sections of C3 must be adjusted to "track," that is, to tune 455 kc. apart at all points on the dial. Since different antennas will cause slight variations, C2 has a knob for peaking weak stations.

You can align the receiver without a signal generator if there are several strong stations nearby. Connect no more than 3' of wire to the antenna clip. Do not touch L3; it comes set at approximately 455 kc. Set the two tiny built-in trimmers on C3 so that the plates are about two-thirds in, and back C2 half a turn from the tight position.

Tune to a strong station around 1,000





# THERMO-MAGIC!

## AC HOT TIP

**HEATS FAST TO PREVENT FOULING!**  
**COOLS FAST TO CONTROL PRE-IGNITION!**

The unique AC Hot Tip Spark Plug insulator is deeply recessed to meet the demands of today's varying driving conditions: stop-and-go city traffic and high-speed highway cruising!

The AC Hot Tip heats fast to burn away oil, carbon and other deposits as soon as they form. These fouling deposits are the cause of misfiring, loss of power and poor performance in high-compression engines. The AC Hot Tip cools fast to control the pre-ignition of high-octane gasolines. Knocking, pinging and rough engine performance are the results of harmful pre-ignition.

Ask your AC dealer to check your spark plugs today. If he recommends new ones, you'll find that AC Hot Tip Spark Plugs are best for today's high-compression engines and high-octane gasolines!



**hot tip**  
**spark plugs**



Watch BIG TOWN on NBC-TV

AC SPARK PLUG  THE ELECTRONICS DIVISION OF GENERAL MOTORS

AUGUST 1956 203



kc.; then adjust the oscillator trimmer on C3 for peak output. Next, tune in a station around 600 kc., but this time peak it by moving the core in oscillator L2 and retuning for loudest reception.

Go back to the 1,000 kc. signal and repeak with the oscillator trimmer. Return to the 600-kc. signal and readjust the oscillator coil. Repeat this sequence until no more than a quarter turn of trimmer C2 will peak any station.

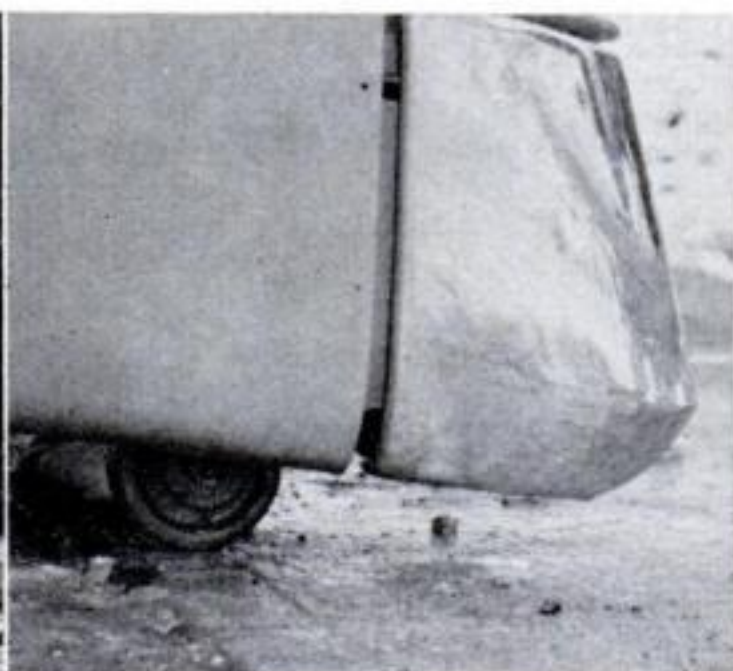
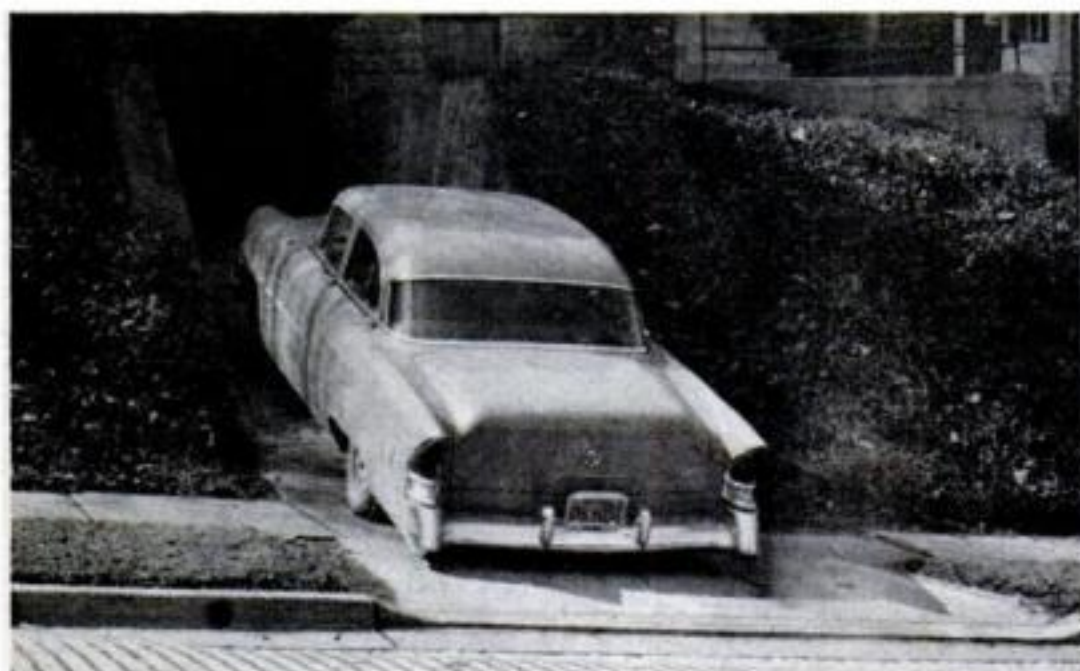
**Operating tips.** Near metropolitan transmitters, you should get reception with a few inches of antenna by turning the set for best pickup. Three or four feet of antenna will give more sensitivity, and bringing this wire near a phone or

radiator should increase signal strength.

If you are far from stations, better pickup may be obtained by boosting C1 to 25 to 50 mmfd. This may require reducing the capacity of C2 and of the antenna trimmer on C3.

Current draw can be checked with a low-range DC milliammeter; V1 alone should take .9 to 1.1 ma.; V2 will take .1 to .3 ma., and V3 (with the phone plugged in) .5 to .7 ma. A lower value for R1 will decrease V1 draw, while V3 current can be changed by different values of R7.

Since total current drain is only about 2 ma., the battery specified should last for at least 150 hours. END



### Caster Welded to Rear of Car Keeps Bumper Off the Ground

WHEN we got our "new look" car, we did a double take. The overhung rear end scraped the road when we backed out of our steep driveway. Rather than rebuild the driveway, I had a heavy-

duty caster welded to the rear cross member of the frame. A bolting job would have done as well: the caster only has to lift the body an inch or two on the springs.—A. A. Markson, Pittsburgh.

### Truck Lamp Lights Up Buoy



A TRUCK clearance lamp mounted on a sealed can enclosing a battery will make a mooring buoy that you can see at night. Screw a ring in the bottom for an anchor rope and solder it watertight. The on-off connection is an insulated terminal post.—L. E. Johnston, Madison, Wis.



### Terminal Makes Fly-Rod Tip

A FEW electric-wire terminals in your tackle box are useful to have on a fishing trip. They make good replacements for fly-rod tips. I bend the eye to a 180° angle before crimping a terminal in place.—John Krill, North Lima, Ohio.





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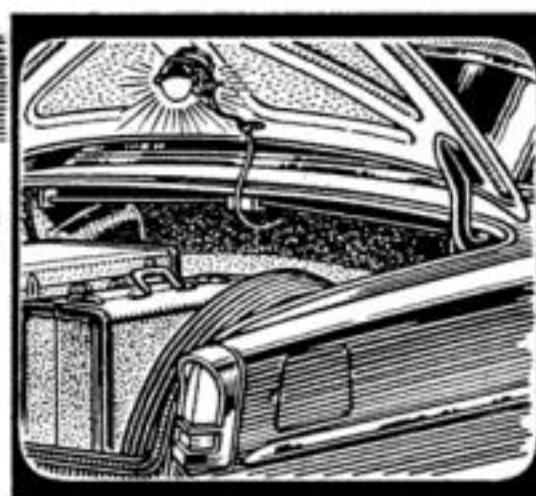
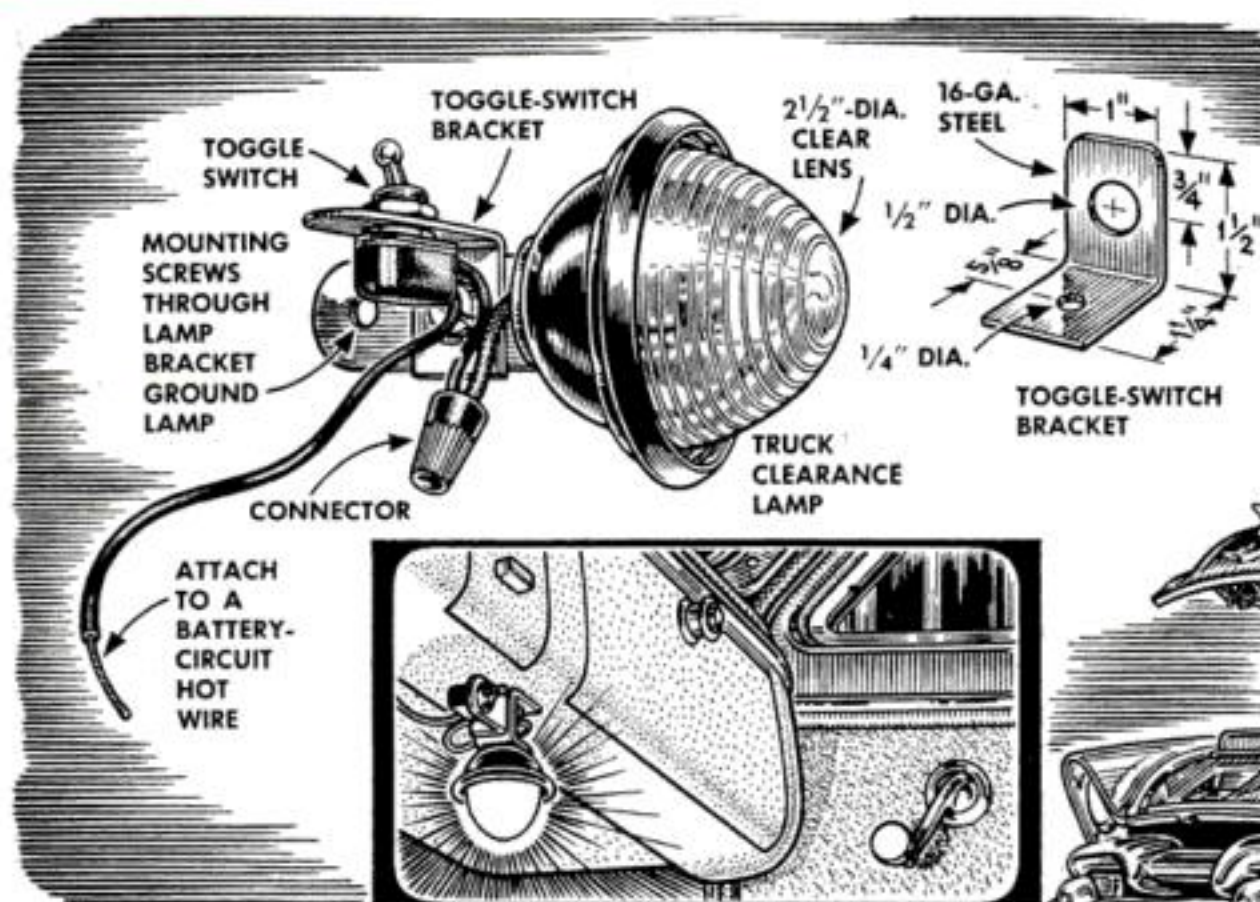
# Hints from the Model Garage



A **cotter pin** will fix an oversize hole into which molding must be screwed. Spread the pin, squeeze together and put it into the hole. The screw, which is of harder metal than the pin, will force itself between the pin and the side of the hole.



You can **straighten dents** in a door without taking off the upholstery if you insert the pry bar through the drain holes at the bottom of the door. You may have to enlarge the holes somewhat to fit a tool like a tire iron through them.



**Light wherever you want it**—in the trunk, under hood or dash—is inexpensive to get with truck clearance lamps. These small plastic-lensed units are stocked by auto-supply dealers in a variety of styles and with several kinds of mounting brackets.

The simple type shown above often sells for less than 50 cents. The toggle switch is attached with a bracket bent from steel, and its wire is connected to the hot side of the battery circuit. The mounting screw makes the ground connection.



*Engineer's Report:*  
**1956 CHEVROLET**

# HERE'S WHY IT'S EASY TO "POINT" A CHEVROLET

By **ED COLE**, *Chevrolet Chief Engineer*

After you've driven a new Chevrolet for a while you'll find that one of the most satisfying things about it is its steering. You "point" it where you want it to go and it goes there—with superlative ease and precision.

The secret is Ball-Race steering, in which 54 micro-polished steel balls provide *rolling* friction instead of the usual

*sliding* friction. The "drag" of friction is reduced to the lowest point we can get it. And, in addition, the *weight* on the front wheels is lightened by moving the center of balance farther back.

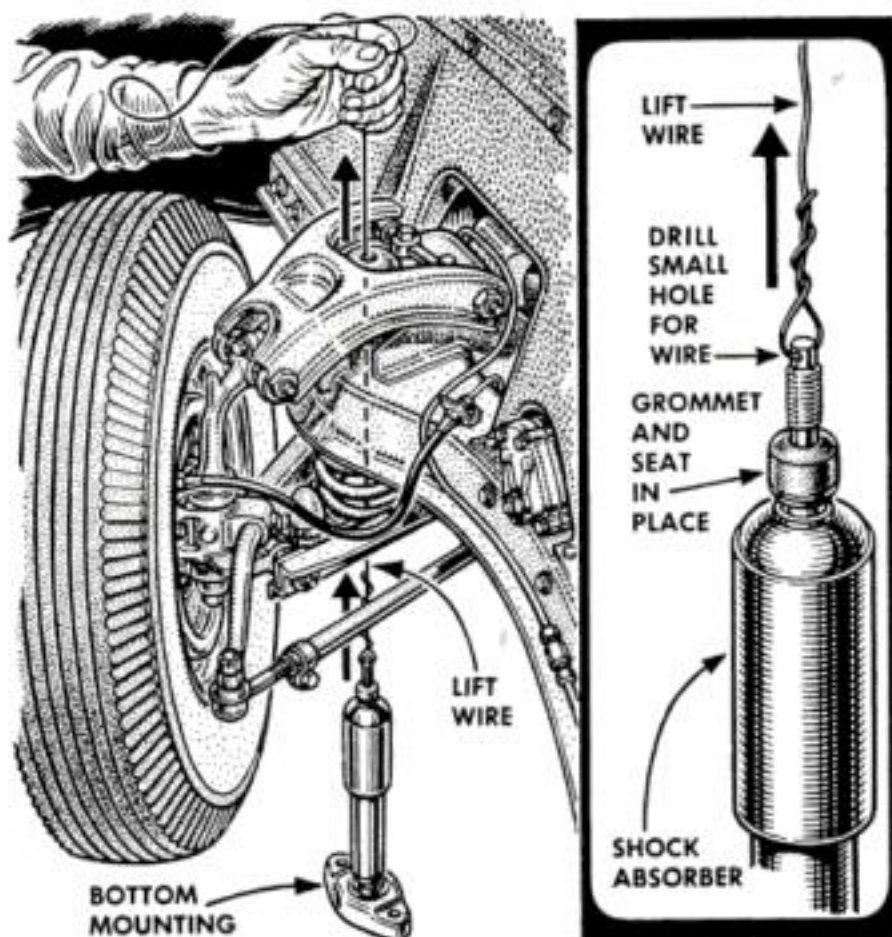
The result is exceptionally light-handed steering—manual steering that comes awfully close to the ease of power steering. Better still, the improved weight distribution gives Chevrolet better rear wheel traction and better roadability.

Our ideal at Chevrolet is to produce the best *road* car the world has ever seen—and Ball-Race steering is a big factor. Your Chevrolet dealer will be glad to arrange a demonstration so you can sample it for yourself—a preview of the additional pleasure Chevrolet can give you during every mile you drive. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

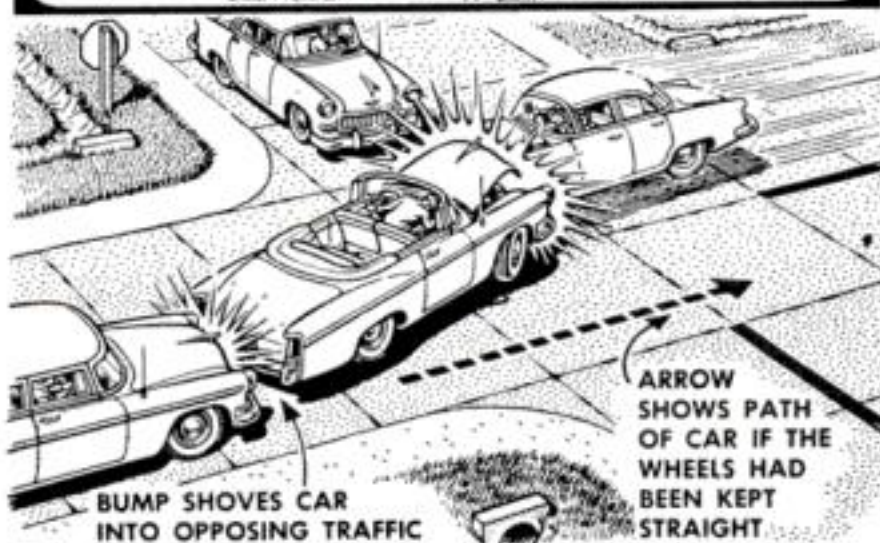
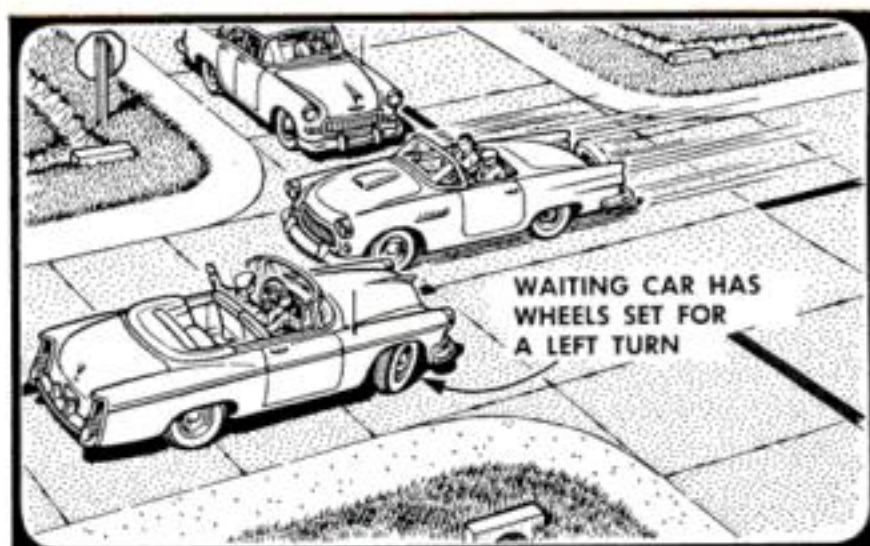




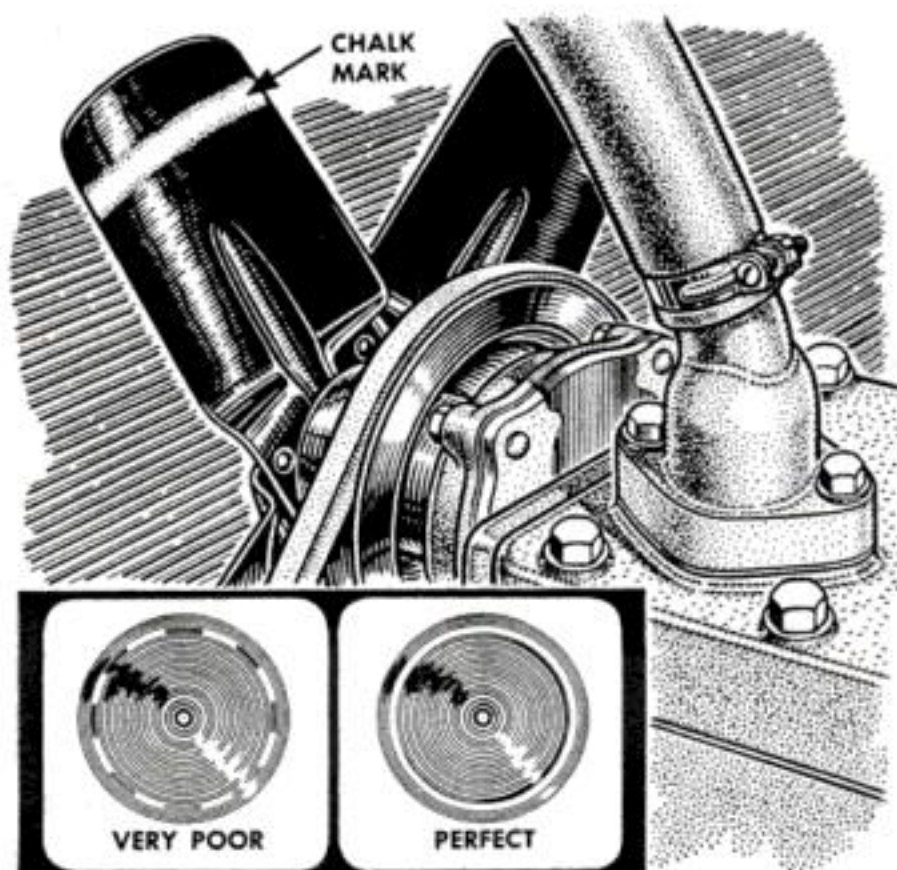
## More Hints from the Model Garage



**Airplane-type shock absorbers** are easier to install on some recent cars if you use this method. Drop a wire through the hole in which the shock fits and thread it through a small hole drilled at the top of the shock. Then pull up on the wire, maintaining even tension while you fasten the shock absorber into place.

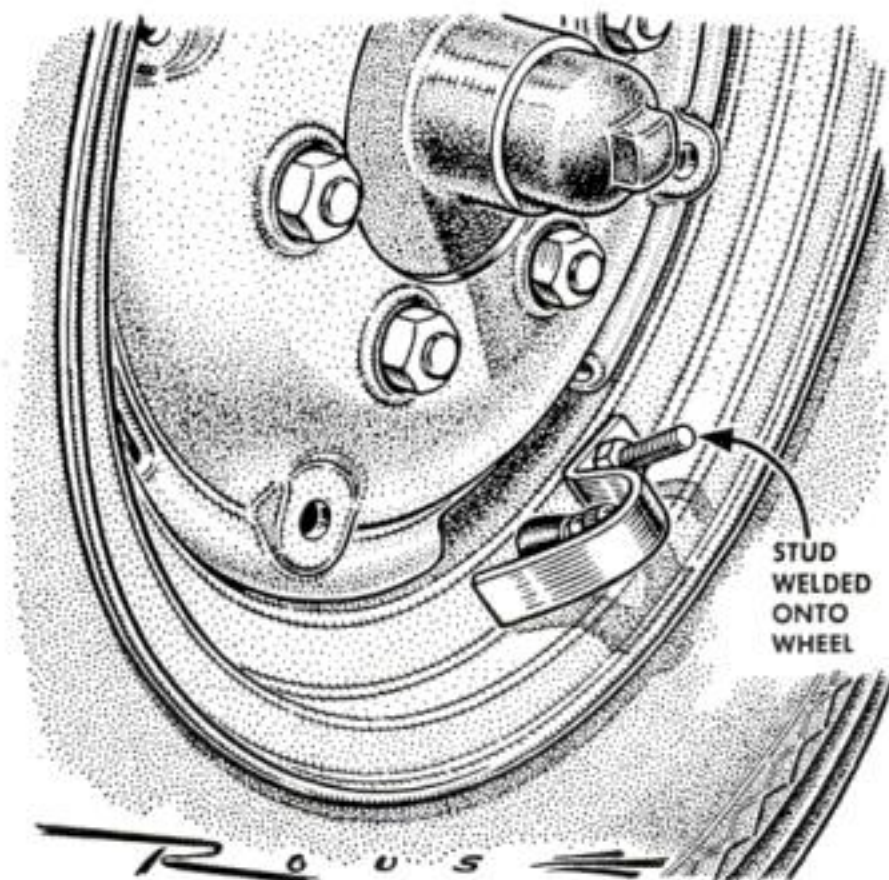


**Keep your wheels straight** when you wait at an intersection to make a left turn. That way you'll just bounce straight ahead if a following car bumps you from the rear. If you sit there with your wheels turned to the left as you wait for an opening, the bump may push you out of your lane and into the oncoming traffic.



**The fan can help tune** an engine. Make a chalk mark across one blade an inch from the top. Then watch the fan while you set the idling screws. When the chalk mark shows as an unbroken circle (right inset), the engine is idling properly.

208 POPULAR SCIENCE



**Valve stems** on the tires of farm vehicles are vulnerable to damage from ruts, rocks and even hogs, that chew them. One garageman protects the stems by welding studs or headless bolts to the rims to hold on bent sheet-metal guards.



# Texaco Tips On Car Care



## ★ Check battery water level

Now, during the hot summer months, it's wise to check your battery water level more frequently than usual. Water evaporates quickly under high temperature, in just a few days can drop below top of plates, drying them out, reducing power and permanently damaging the battery. Maintain water level approximately  $\frac{3}{8}$ " above plates. And to protect battery terminals from corrosion, scrape or wire brush both clamps and terminal posts until clean and then apply a coating of light grease.

## ★ Enjoy powerful engine performance

For fast starts, top passing power and performance — for all the power you paid for — use *Advanced Custom-Made Havoline*, the motor oil that out-performs them all. It keeps your engine clean, guards against wear and rust. Get the best motor oil your money can buy — *Havoline*! The man to see is your Texaco Dealer, the best friend your car has ever had!



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## Gus Seizes at a Straw

[Continued from page 146]

He traced the gas line from tank to carburetor for leaks but found none.

He crawled out, lifted the hood and looked at the motor, a baffled expression on his face. He shook the dirt from his graying hair, and with a stubborn look got a jack from the service car.

"Pump a bit more, will you, Morgan?" he said, as he jacked up the rear wheel and rammed his head under the fender.

**S**LOWLY a barely perceptible spot of moisture appeared on the line. It was something that a person almost imagined he saw, disappearing in the heat of the day as fast as it showed.

"Ah!" Gus grunted, pulling his head from beneath the fender, moving to get a hacksaw and brass tubing connector from his kit. He released the air from the line, sawed it in two, coupled it together again.

"I have an idea that she'll take you now," he told Morgan.

"We'd admire to have you eat a bite with us," Morgan said, nodding to where Mrs. Morgan had spread a picnic lunch.

Gus was about to decline the invitation when the honey-haired little girl came to slip her hand in his.

"You're the nicest mechanic we ever had," she declared solemnly. "You saved our rabbits."

"Thank you," Gus told her, smiling. "It's a long time since I picnicked with a pretty girl."

Sitting in the shade with a sandwich in hand, Gus explained to the Morgans what their trouble had been.

"Lack of gas on steep grades," he said, "is such a common occurrence in this business that we mechanics have pretty well adopted a routine trouble-shooting schedule for it. When I found that several mechanics had worked on your rig, and all muffed it, I knew that it had to be something out of the ordinary. Holes and leaks in gas lines are, of course, common—most mechanics would spot such a thing at once. But this hole was so small that it was practically nonex-

istent. It neither leaked gas nor sucked air, except when you got on a very steep, long grade with a load.

"You see," Gus went on, "a motor naturally requires more gas on a heavy pull. The gas pump takes a longer diaphragm stroke, creates more vacuum pull on the line. It is also pulling the gas uphill, against the pull of gravity. Only under these conditions did this pinhole in your line cause trouble. I first suspected it when I thought I saw tiny air bubbles in your glass filter bowl just as we topped the grade. Such tiny bubbles, if the grade were long enough, would build up an air lock in the line and starve out the motor."

**"W**HY didn't those other mechanics find it?" Morgan wanted to know. "They fixed us enough to pull the grades."

"Because," Gus told him, and he grimaced, "of routine procedure in a case like this. Each mechanic immediately uncoupled the gas line and spun the motor to see if the gas pump was working. In doing this they pumped out the air lock and fixed you up so you could pull the grade. Naturally, they did this and that also, and when you pulled the grade they took it for granted that they had corrected the trouble."

"How come *you* didn't?" Morgan asked.


"I didn't want to be just another mechanic who got the Morgans over a hill," Gus said. "And then I got to thinking about a nice, cold, thick, malted milk, so thick that the straw would flatten when you tried to suck it up and you had to use a spoon. Your gas line couldn't flatten under extra-heavy suction, Morgan, but it could suck air, even through a pinhole."

"I'd like a malted milk, right now—a real thick one," the honey-haired tot said. "Strawberry flavor."


"Stop at the Model Garage as you pass," Gus told her as he left, "and the malted milks will be on me. In fact, I think I'll even have one myself." **END**

**NEXT MONTH: Gus and the woman driver.**





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**New Powerfire electrode** stands up better in today's high-power engines. Photo shows how ordinary electrode (left) burns away. Champion's Powerfire electrode (right), after identical use, is still good for many more miles of powerful performance!



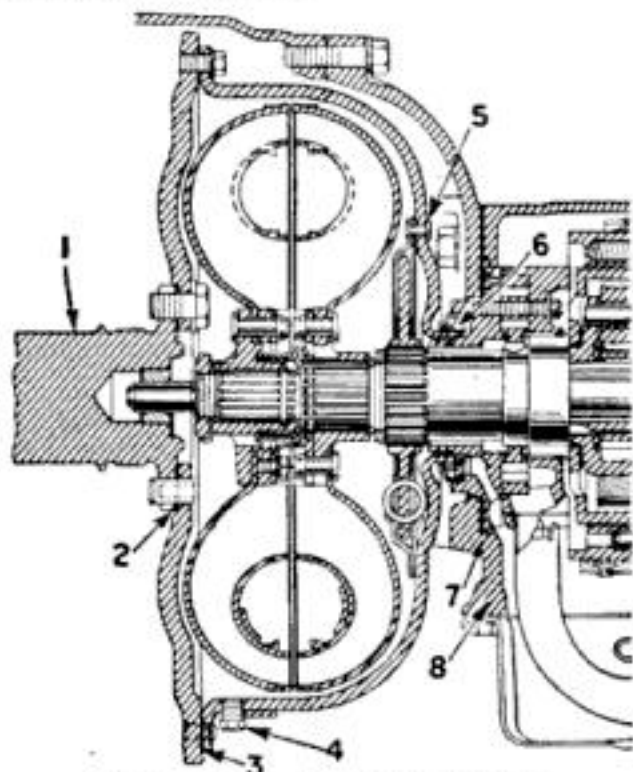
# Care and Feeding of Engines



BY  
S. P. CORP

## WHERE'S THAT OIL LEAK?

When your car is on the hoist, see if the rear of the engine is covered with oil. This could mean a leak (1) from rear main bearing oil seal, (2) from front bearing oil seal, or (3) if you have automatic transmission, from the torque converter.



## TORQUE CONVERTER

To locate leak, add  $\frac{1}{2}$  teaspoon of oil-soluble dye to crankcase oil after engine is warmed up, and let engine run until dye is well mixed. Stop engine, wipe off outside oil, put clean paper under car. Run engine for two minutes at 1000 r.p.m. Colored oil on paper shows main bearing leak.

- (1) Uncolored oil shows leak in torque converter.
- (2) Between crankshaft and flywheel; tighten bolts.
- (3) Torus cover and flywheel; tighten bolts. (4) Oil drain plug. (5) Dampener rivets. (6) Front cover oil seal. (7) Front cover gasket or pump cover. (8) Oil pan to case gasket.

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# Sealed Power

## PISTON RINGS

## What Wood to Use?

[Continued from page 134]

Highly porous woods, even in the hardwood class, present special finishing problems and require careful filling and sealing. Here's how a few of the most common woods compare. Among the large-pored are: ash, chestnut, elm, hickory, mahogany, oak and walnut. Some of the small-pored woods are: beech, birch, cherry, gum, magnolia, maple and poplar.

**Outdoor woods.** Only three types—cedar, cypress and redwood—are recommended for use unpainted in outdoor or semi-exposed areas.

Of these, cedar has the highest natural resistance to decay. Stilt houses in swampy southern bayous are still stand-

.....

*Tact is the ability to get a person to take advantage of an opportunity for you.*

—THE SIDEWALK SUPERINTENDENT

.....

ing on cedar piles 100 or more years old. Cedar lumber—except in the form of house shingles—is likely to be expensive outside of the South.

Redwood is cheap and plentiful in the West, cypress in the East and South. Both resist rot and weathering, and can be made even more durable if painted, sealed, or treated with preservatives. Though fairly hard, both are light and porous. They do not take a high finish, and are best suited for house siding, paneling and construction uses rather than cabinetwork.

**Shop ahead of time.** Woods common to one area may not be available in others, but this does not mean that you can't find good substitutes.

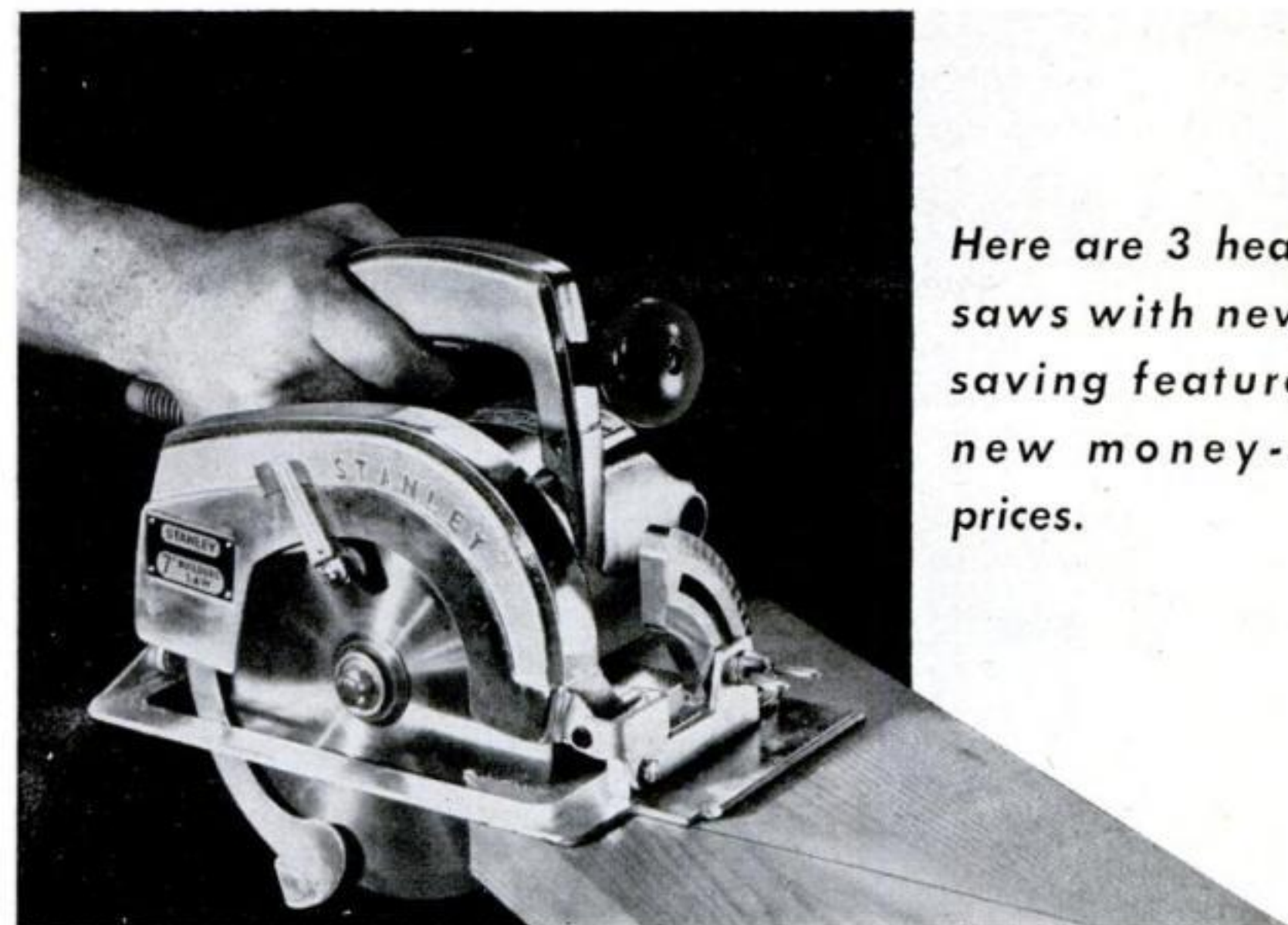
A southerner would be ill-advised to use top-grade northern pine when it would cost him as much or more than most southern hardwoods. Around the Great Lakes, you can get a Brazilian pine that resembles birch—at about one-third the price.

Use the lists given here to check the woods that are available in your own community.

END



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## Building a New Mayflower

[Continued from page 141]

ings of ships. There were also woodcuts and paintings to study, but their accuracy varied all over the ocean.

Notebooks kept by shipwrights were Baker's most valuable source. He also found much design information in an anonymous treatise of about 1600: "A Most Excellent Manner for the Building of Shippes."

**Starting with the hull**, Baker found that the faired, parabolic lines used in modern shipbuilding were unknown in the 17th century. A straightedge and compass were the designer's only tools then. Thus every curved line had to be an arc of a circle or a combination of lines derived from circles.

This sometimes caused trouble. Where arcs of different radii came tangent, the completed hull had a noticeable bump. The bumps could have been anticipated and smoothed out in the plans, as they are today, if the earlier shipwrights had used water lines and buttock lines. But these refinements came into regular practice several hundred years later.

**Decks were not continuous** from bow to stern as they usually are today. On the *Mayflower II*, for example, there will be four decks aft, two amidships and three forward. Deck heights varied too, with as little as 4½ feet clearance in the 'tween-deck cargo space. Baker believes that the *Mayflower* crew probably slept in hammocks slung in this space, or even on coils of rope.

Modern visitors will get a better break. Baker provided a six-foot deck height throughout the ship, except for a small cabin aft. Cramped quarters there add an old-time flavor—but visitors over five feet three inches will have to duck.

**Sails were fairly simple** to copy from old prints; but masts, yards and rigging were a headache. The 12 spars on the reproduction were sized after comparing many sources, including a shipwright's notebook, an old manuscript and a shipbuilding dictionary. Details of the rigging had to be ferreted out of half a

[Continued on page 216]



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dozen books published here and in England, then cross-checked against models and paintings. Twelve tons of rope will be needed for it.

**Fittings to hold rigging** and other lines in place were the toughest reconstruction job. Where can you order a 17th-century chain pump, a wooden capstan, riding bitts (to secure lines) or lead-pipe scuppers with outside leather covers? No one makes them, so Baker had to do more sleuthing. His most dramatic assist came from some 17th-century ships lying on the bottom of Kalmar harbor in Sweden. Blocks and deadeyes for the *Mayflower II* will be copied from those dredged up out of the wrecks.

Building the ship has been like living three centuries ago for 25 shipwrights and a blacksmith at Upham's Shipyard. Laying down their customary power tools they wielded unfamiliar pit saws, pod augers, gimblets, roundbottom planes and adzes. The shipwrights hewed the 58-foot keel from two 120-year-old oaks to an accuracy of one-sixteenth of an inch—swinging mattocklike adzes.

Lumbermen scoured England for enough big timber to build the ship. The two keel sections, for instance, are a true 12 by 14 inches. There has been no hold-up for lack of timber, but the sponsors are taking no chances. The three masts are being shipped from Canada; trees that tall don't grow in Britain today.

**Finding the 21-man crew** for the *Mayflower II* has turned out to be the easiest task so far. Over 1,000 Britons have already volunteered to sail the ship. Most of them, of course, have no idea what it will be like when 40-foot waves buffet the little vessel.

Despite this prospect, many old-timers in sail are among the volunteers. Commander Alan Villiers has been named skipper. Author of some 18 books about seafaring under sail, Villiers earned his rank by leading a squadron of British landing craft ashore in Europe and Southeast Asia.

Among others who will make the voy-

age are three men who sailed with Villiers some 20 years ago on a 58,000-mile trip around the world aboard the *Joseph Conrad*, a former Danish schoolship. One is still a seaman, another is a schoolmaster and the third is a chaplain. They will be joined by a shipping magnate with a master's ticket in sail, a salt from the last commercial sailing ship afloat, and a viscount who shipped out recently as deckhand on an ore carrier "to keep his hand in."

**Navigation instruments** of the 1600s have been donated by one of the oldest makers in the business. Villiers will use these to cross the Atlantic, much as Captain Christopher Jones did centuries ago. Only a radio, required by the Ministry of Transport, will remind those aboard that this is the 20th century.

Donations of nautical instruments and other gear have cut the cost of building and outfitting *Mayflower II* in half. Blankets, flax sails, soft rope and wool clothing are some of the contributions from manufacturers. Even so, the cost will run to \$300,000—all of it being raised by public subscription in England.

**No passenger list** has been made up yet, but one fellow sure of passage is John Winslow, 20-year-old Royal Navy midshipman. Mary Chilton and John Winslow of the *Mayflower* were his direct ancestors. Another passenger may be William Brewster, twelfth-generation descendant of Plymouth's first governor.

When *Mayflower II* drops anchor at last off Plymouth, Mass., the passengers will be dressed like the early Pilgrims. Ashore they will meet American descendants of Pilgrims, also costumed. The new *Mayflower* will do some visiting along the Atlantic seaboard, then return to become a permanent display, part of Plimoth Plantation's 50-acre reconstruction of early Plymouth. END

---

### Runnin' Wild

"It's not the work I enjoy," said the cab driver, "it's the people I run into."—*McCall Spirit*.





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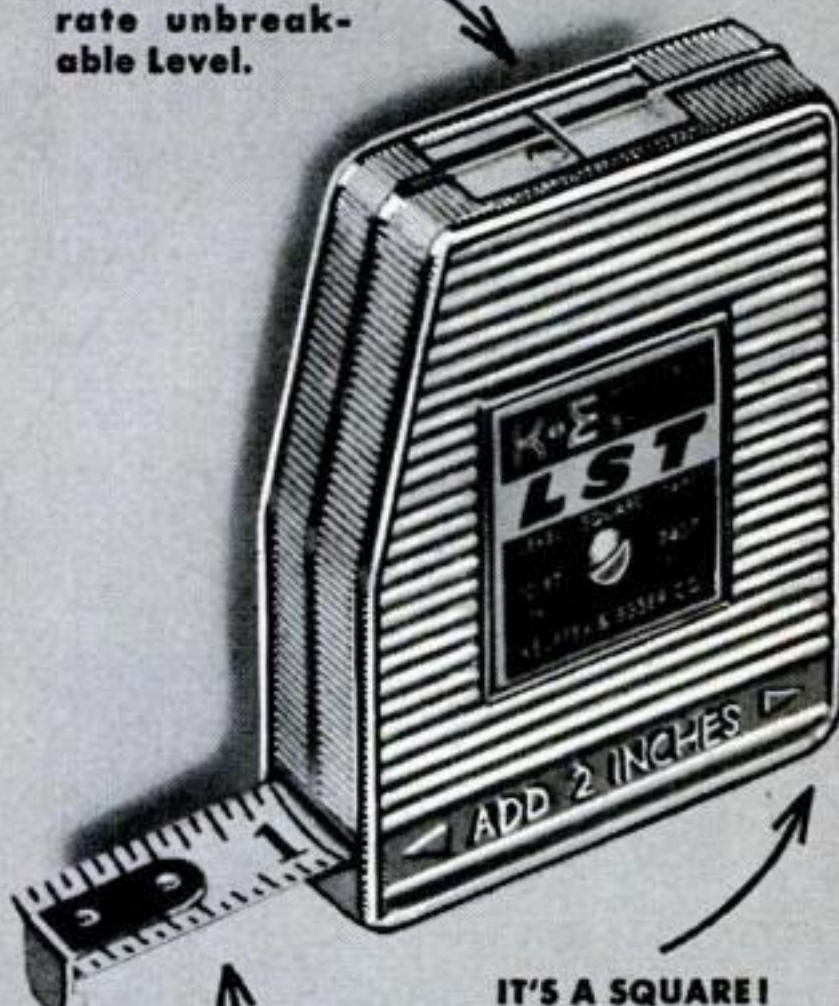
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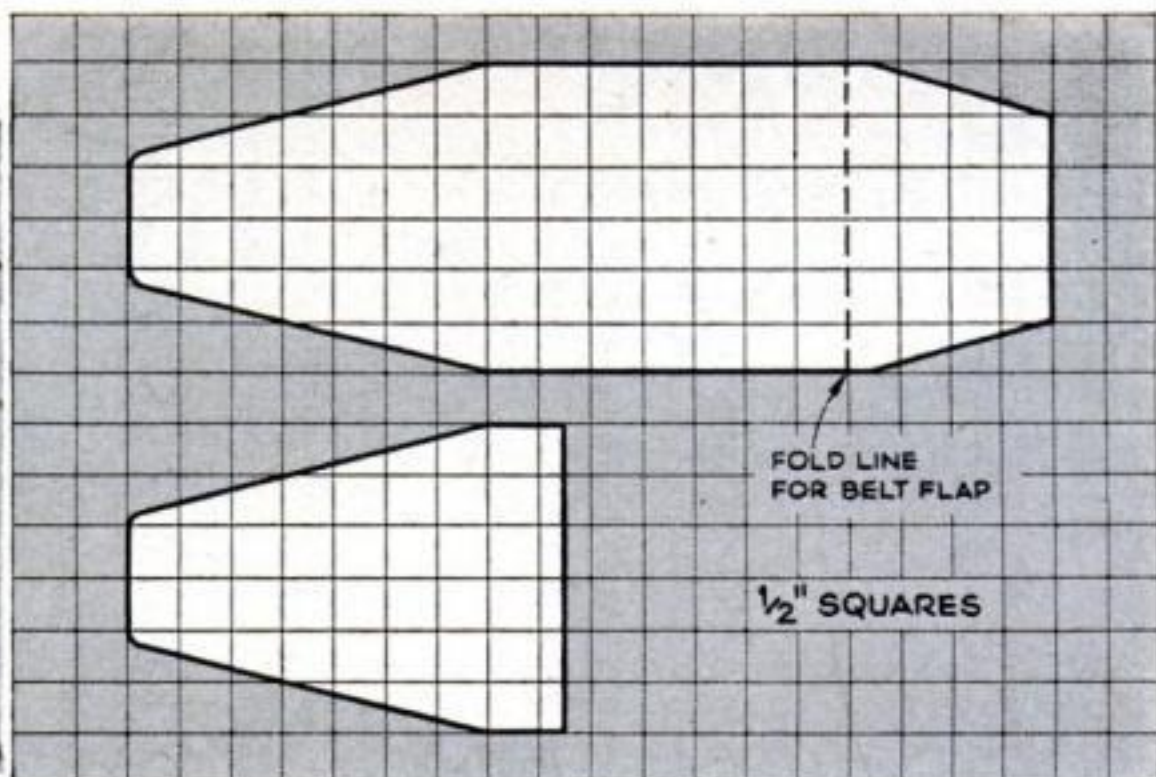
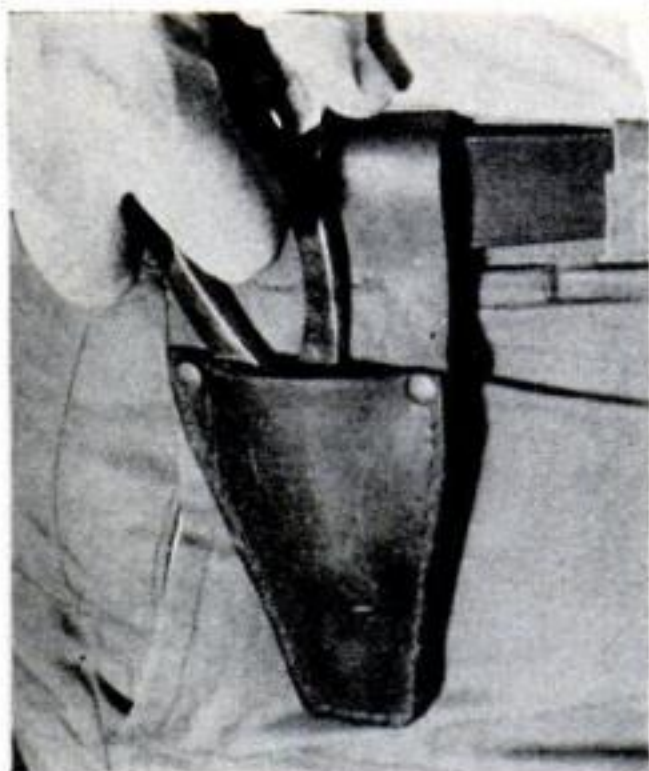
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NO MATTER how hard you press the lid back on, prepared crack filler and putty often harden in the can. Try keeping the can in a plastic bag. Clamp the opening shut with a clothespin.—*Warner G. Tilsher, South San Gabriel, Calif.*

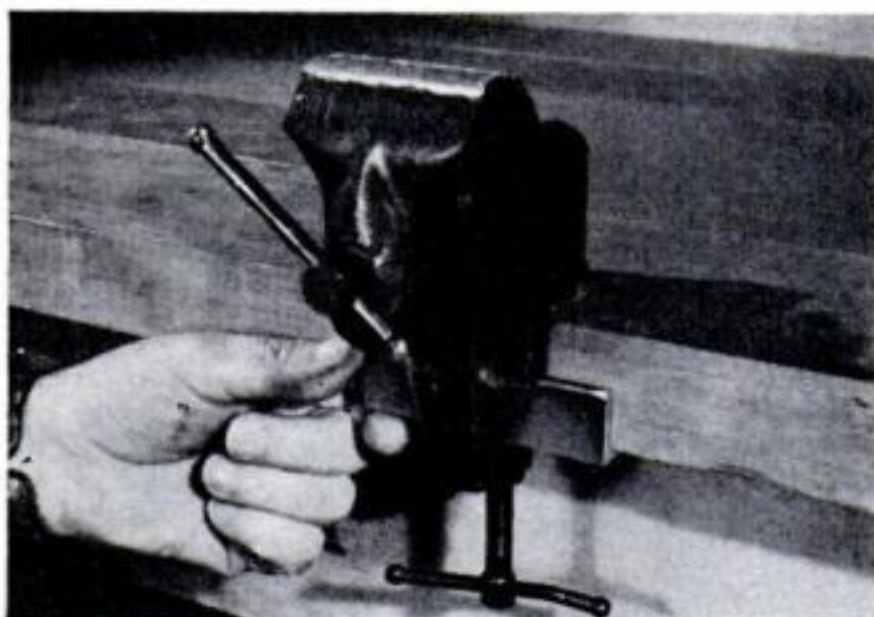
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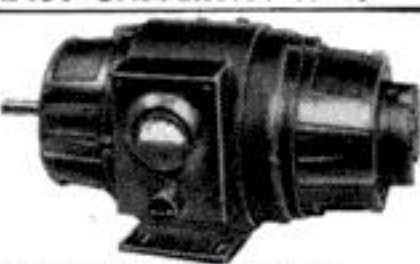
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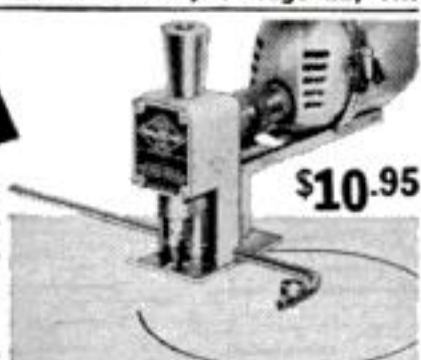
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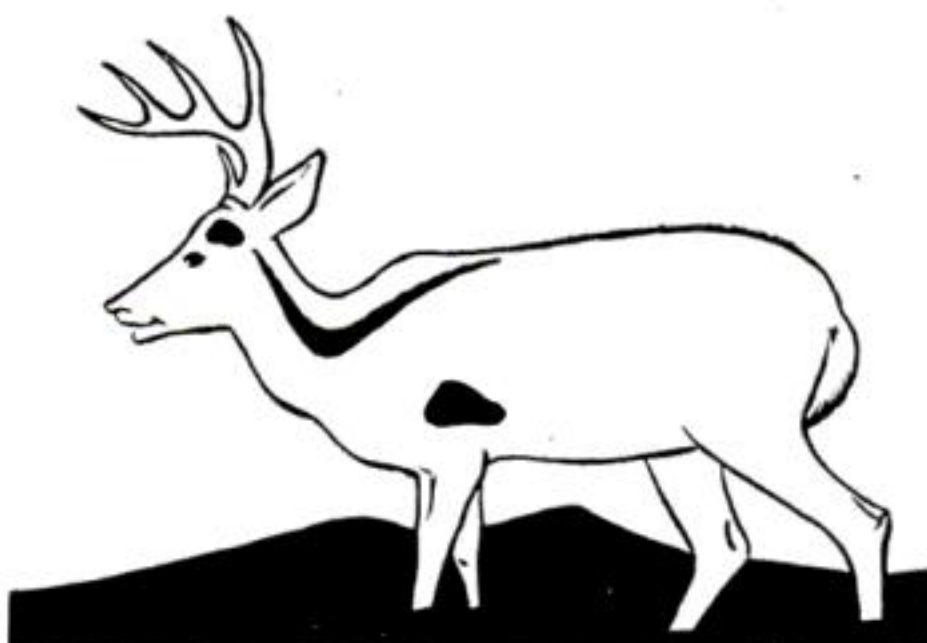
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220 POPULAR SCIENCE

**"Bulldozer U" Men Push Campus Around**  
[Continued from page 76]

be choosy about jobs—it still doesn't thunder violently along in a manner irresistible to the young.

Everett Kendrick, the school's director of field training, says that after watching 12 different classes come along (the school was founded in the spring of 1955), he can now tell at a glance how far along the month has progressed. "During the first week they're earnest and a little scared. Second week they start to get the hang of it. By the third week they think that they know everything, and we have to ride herd on them. The last week they've settled down and work hard to be sure they'll graduate."

**The taught teach.** Building a good staff was one of Shaw's toughest problems. Kendrick, the field director, is a big, quiet man of enormous competence. In construction work for 30 years, he manages machinery with deceptively easy artistry. ("That guy," an awed student confided, "can write his initials with any piece of equipment on the place.") Sumner Willis, in charge of classroom work, is a second cornerstone of the staff—a capable, friendly person with a background of teaching truck driving. In the future, NSHEO may help to create its own teachers; Hugh Hamilton, honor graduate in the first class, was recently hired as an instructor after a year's work in the field. Counting Shaw, seven men staff the school.

Shaw confesses wryly that NSHEO was founded by accident. Several years ago he had an auto-driving school that was running so smoothly it didn't absorb his impressive supply of energy. He cast around for something that had never been done before. The notion of a school for truck drivers caught his fancy, but he discovered in POPULAR SCIENCE MONTHLY for July, 1954, that a truck-driving course was already offered at the North Carolina State College.

This was annoying news but Shaw trotted over to Raleigh to learn all he could about it, because a new notion

[Continued on page 222]



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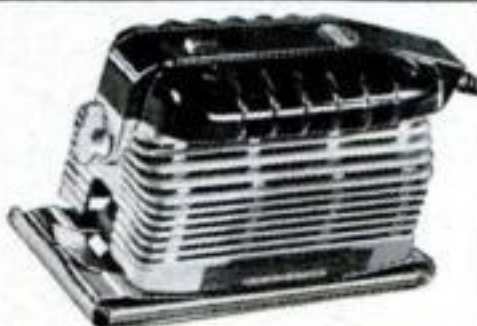
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## "Bulldozer U" Men Push Campus Around

[Continued from page 220]

was buzzing in his bonnet. Contractors were plagued by a scarcity of good earth-mover drivers—why not start a heavy-machinery school? "I didn't know one end of a bulldozer from another," he says, "but I figured I could learn."

Getting started took some doing. The school had to have a quarter of a million dollars' worth of earth-moving machinery, and Shaw didn't have that kind of capital. His solution was characteristic. He went to a big equipment distributor and enthusiastically unfolded his plan. First he pointed out that the school was really needed. Then he emphasized that working operators' likes and dislikes greatly influence a contractor's purchases—and most men keep a fondness for the brand of machine they learn on.

The distributor agreed to stock the school with machines, in return for only a nominal rental.

**The shining future.** Once rolling, NSHEO gained momentum rapidly. Its

present 30-students-a-month rate is full capacity, and the tractor course is usually booked up months ahead. Shaw has taken options on several hundred acres of potential campus nearby. A new classroom is abuilding, designed so that bulldozers

.....

*Courage is what it takes to pass a state trooper even though you know you can keep within the speed limit.*

—THE SIDEWALK SUPERINTENDENT

.....

and cranes can clank up to the instructor's platform. Plans under way call for a second school probably in the Far West.

Shaw's imagination misses few tricks. Recently he has been musing about the idea of admitting girl students. "We've had some inquiries," he says, "none especially serious. But if a fully qualified girl should apply, we probably wouldn't turn her down automatically. We wouldn't even hold it against her if she's good-looking."—Frank Rowsome Jr.



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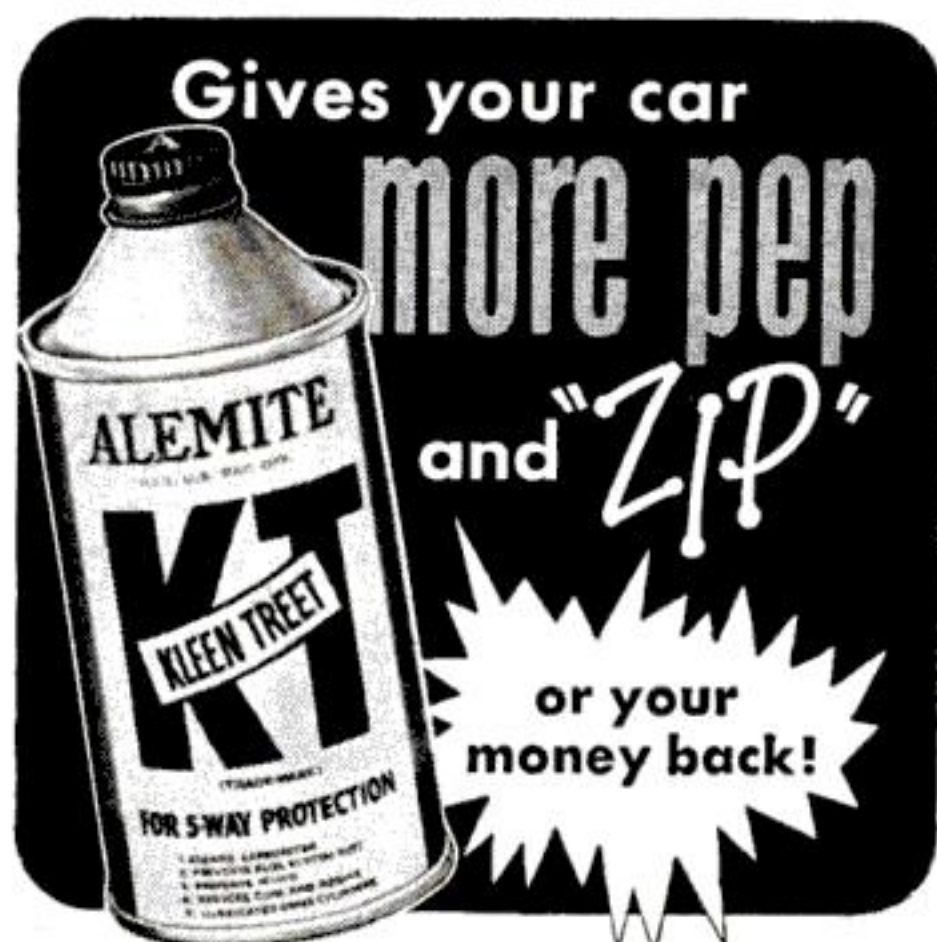
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## World's Toughest Building Project

[Continued from page 91]

went down to the U.S. 18th Air Force at Greenville, S. C.

The answer was three groups of giant C-124 Globemasters and three groups of C-119 Flying Boxcars. In some cases the big planes had to paradrop smaller tractors so that adequate airstrips could be cleared for them to land. On one drop the parachute failed and a tractor crashed down on the sea ice, making what one Air Force officer termed "the biggest ice-fishing hole in the Arctic."

*No plane as big as a Globemaster* had ever landed on an ice strip before, so ice experts were sent in to make tests. They determined that with a weight of 168,000 pounds, the planes could land safely on ice six feet thick. They did—in hundreds of landings, sometimes even when the ice was beginning to puddle.

Priority during this early phase went to the building of land airstrips so that the planes could continue to come in when the ice strips were lost by thaw. That called for enormous quantities of gravel. It was the one material contribution of the Arctic to the Dew Line, and is found near most of the Canadian sites, although often many miles away.

Gravel is used not only for making land airstrips, but for roads and the foundations of buildings. It insulates the permafrost so that it won't thaw during the brief summer. This sometimes calls for a pad 12 feet thick.

*This fury of activity* in Arctic blizzard and cold was aimed at meeting a deadline: The mass sea lift that had been building up to rush in at the sign of the first crack that could be widened by icebreakers into sea lanes.

It was August before the ice air-reconnaissance pilots of the U.S. Navy and the Royal Canadian Air Force gave the word, and the ships came in. There were two convoys of 50 to 60 ships each that had sailed northward from East and West Coast ports in June. They were led by six icebreakers of the U.S. Navy and Coast Guard, and the new Canadian

[Continued on page 226]



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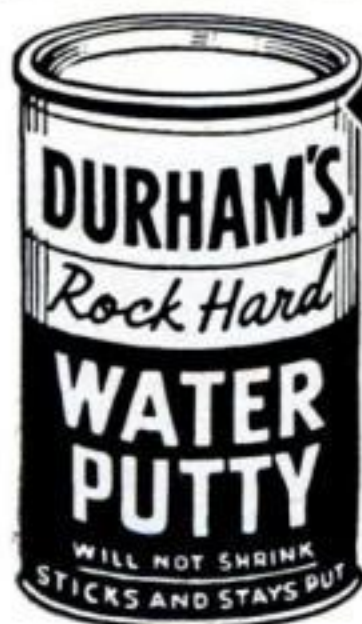
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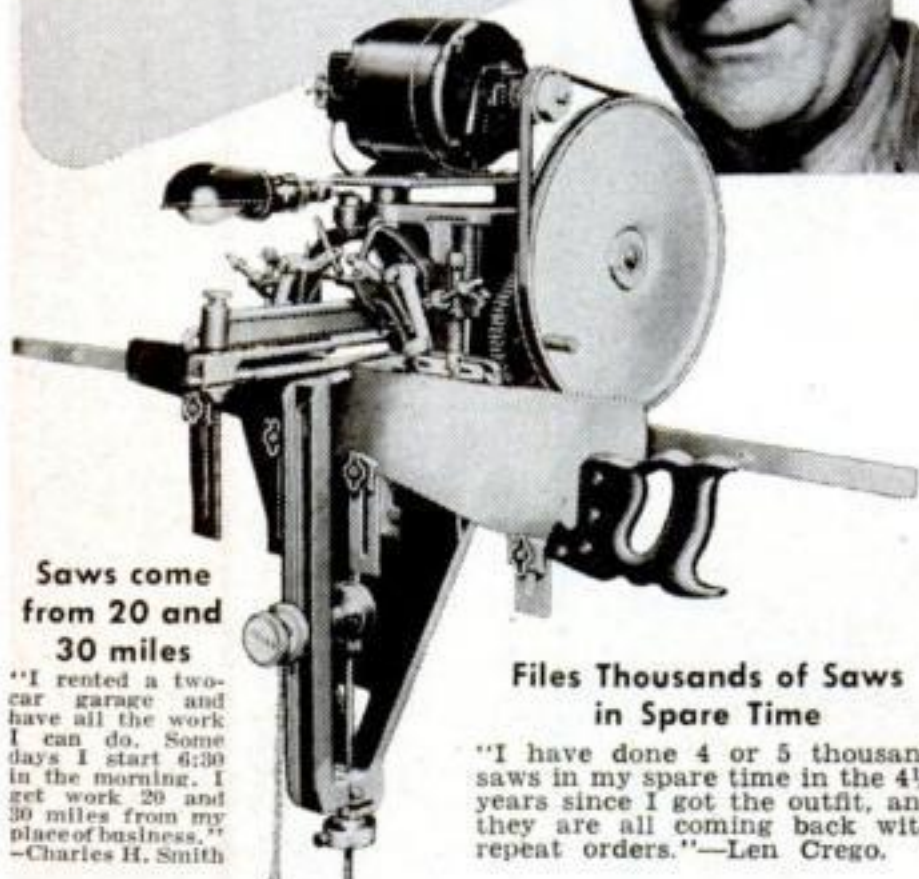
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"I rented a two-car garage and have all the work I can do. Some days I start 6:30 in the morning. I get work 20 and 30 miles from my place of business."  
—Charles H. Smith

Files Thousands of Saws  
in Spare Time

"I have done 4 or 5 thousand saws in my spare time in the 4½ years since I got the outfit, and they are all coming back with repeat orders."  
—Len Crego.

### FOLEY FILED SAWS BRING NEW CUSTOMERS

Here is a steady repeat CASH business you can start in your own basement or garage and make up to \$3 or \$5 an hour in your spare time. Every saw you sharpen with the machine accuracy of the Foley Saw Filer is an ad that brings more customers. S. M. Hollingshead wrote to us: "I am doing very well with my Foley Filer, and I am glad I invested in your machinery. It is very satisfactory and works very well in the small community in which I live."

You can file all hand saws, also band and crosscut circular saws on the Foley Saw Filer. The adjustments are simple—there is no eyestrain—and you can start right away to turn out perfect cutting saws. "The first saw I sharpened with my Foley Saw Filer came out 100%. I think it is a marvel of perfection."  
—writes Clarence E. Parsons.

"MONEY MAKING FACTS" explains how you can get business from hardware stores, home owners, farmers, carpenters, schools, mills, factories, etc. Just think—with a modest investment, no overhead, no stock of goods to carry, you can start right in on a cash business that will help pay the rent, buy groceries, or a new car. Get the facts—send coupon today for this practical, money-making plan. No salesman will call.



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Send me free book "MONEY MAKING FACTS"

Name.....

Address.....

### World's Toughest Building Project

[Continued from page 224]

Labrador. In their wake came 48 more vessels: cargo ships, LSTs, tankers, repair ships, LSDs, tenders, tugs, survey ships.

**On the thawed-out beaches** more than 3,000 specially trained Army stevedores were ready to handle the cargoes. Frogmen of Navy underwater-demolition teams had been blasting out ice and underwater obstacles. The shore of the Arctic Ocean at Point Barrow and other off-loading points resembled the amphibious-invasion beachheads of World War II after a D day.

Before the ice pack closed in again, in one of the worst ice years on record, almost 250,000 tons of cargo and 50,000 barrels of petroleum products were stored ashore, waiting to be cat-trained or air-lifted to Dew Line sites.

In the winter that followed, two months' work was done in one night—an Arctic night, that is, lasting from December to February. So it was a different Dew Line that the sun saw on its first brief peeks above the horizon in 1956.

**More than 5,000 engineers** and construction workers had performed miracles. Gravel roads and airstrips were finished at many sites. Foundations had been set and modules were in place, forming buildings. Inside, carpenters, plumbers, tinsmiths, electricians and many other skilled workers were putting on the finishing touches to make them livable. Drinking fountains in the corridors had fresh water on tap. Electronics experts from Western Electric were preparing to come in with radar equipment.

Although details of these sky-sweeping electronic eyes are secret, it is known that they can pick up the fastest, highest-flying jet bombers in operation today. What we are buying in the Dew Line is time—four to six hours' warning if an over-the-top-of-the-world atomic air attack is aimed at the U. S. END

*This is the first of two articles on the Dew Line. Next month's will tell how the builders met unusual problems that face a housing project above the Arctic Circle.*



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**LUBRIPLATE**

THE MODERN LUBRICANT

## Chicago to New York: 17 Hours

[Continued from page 104]

"Do you mind if I feel the upholstery?" he asked.

I thought he was kidding. He laid a gentle hand on the red-and-cream cowhide and pumped it up and down.

"I work for the company that developed the foam cushions for this baby," he explained. "Thanks a lot."

**Last stop.** We lived it up in that service area. It was 3:07 before we pulled away. Thirty-nine minutes didn't seem too much time to blow on a good meal and a final 14.1 gallons of gas.

We cleared the Pennsylvania Pike at 4:50. With exactly 600 miles between Mark II's rear bumper and the Indiana line, our overall average had only dropped to 56 m.p.h., despite three stops, two meals and miscellaneous reduced-speed zones for tunnels and bridges. It pointed up the fact that the trick in making time is not so much in going fast as it is in *not* going slow.

Traffic was thickening up a bit in the afternoon. Luckett said that we had eased around a total of 202 passenger cars, with 132 trucks thrown in for variety. This didn't seem high for 600 holiday miles—an average of less than one vehicle per mile. Fifteen cars (but no trucks) had passed us, all over the limit. Only four times on the 360-odd miles of the Pennsylvania Pike did I have to toe my brakes for traffic.

One problem we had anticipated was that of the driver who cruises along at a sedate speed until you try to pass him, then suddenly zooms up to the legal limit. When that happened, I made a point of not crowding the issue. I simply dropped back a safe distance and waited until he tired of the pace. We found he usually lets you by on a second try.

**Home stretch.** We glided smoothly over the new Delaware River Bridge and its eight-mile connecting link to the New Jersey Turnpike. Once we hit the main stem, we kept the needle steadily on the limit to the end of the run. Luckett, who had been hoisting his six-foot-four frame—

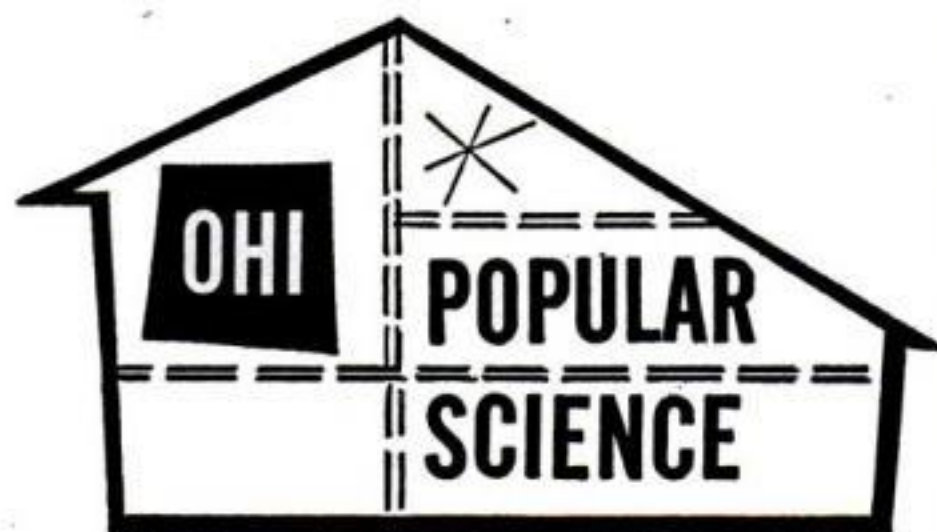
[Continued on page 230]





## It's the HOT season...

... for Home Improvement. Whether you want to put on a new roof, modernize your kitchen, add a room or even paint—your local lumber and building materials dealer is ready to help you arrange all details. **POPULAR SCIENCE** can also help improve your home, by showing how you can do-it-yourself. Every issue will give you the details and the 'how-to' of home repairs and remodeling. So, enjoy the thrill of a modernized home. Home improvement loans can be easily financed by an FHA-Insured Title I loan.



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New! **"DOUBLE-STRIP" 5 Way**  
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**WENDELL MFG. CO., Dept. 220**  
4234 Lincoln Ave., Chicago 18, Ill.

## Chicago to New York: 17 Hours

[Continued from page 228]

over the seat for pictures from both front and back, reported a grievance: There was no more knee room in the back of Mark II than in cars costing \$8,000 less.

When I paid my toll at the end of the turnpike it was 6:04 p.m. On the last stretch, 24 cars and one bus passed me, as did two trucks. I had crept around 10 trucks and 48 cars. The odometer showed that we had come 674 turnpike miles since dawn (there were hours of daylight left), and we had shoved them behind us in 716 minutes. Our average turnpike speed, including one hour and 12 minutes for stops, was 56.6 m.p.h. And not all of the turnpike ribbon had been placarded at 65 or even 60. There were plenty of stretches marked 30. Our turnpike tolls came to \$7.55.

Eight minutes later, Mark II had

.....  
**NEXT MONTH: Chicago to New York in a Volkswagen. Two guys fold themselves into the little rear-engine work-horse and try to beat the Continental's time over the same course.**  
.....

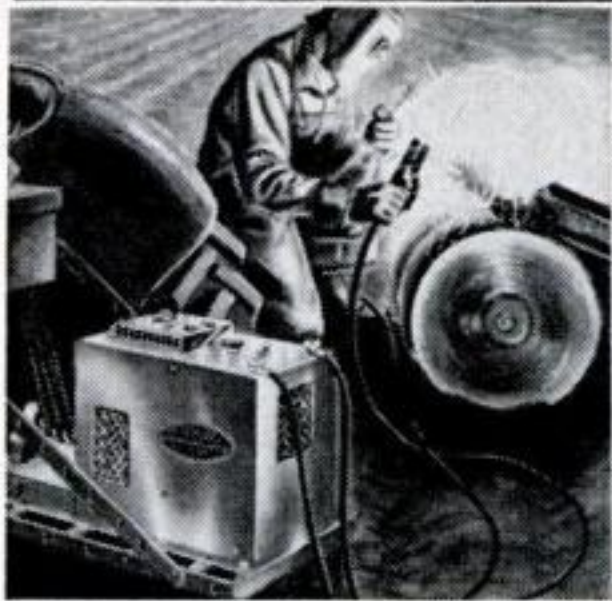
rolled over the George Washington Bridge and into the warrens of Manhattan. (Where, incidentally, it changed from being a superb turnpike car into an only slightly reduced version of the Queen Mary.) Our total traveling time from Chicago stacked up to 17 hours and 18 minutes—or 15 hours and 31 minutes of actual driving time. (The "20th Century Limited" takes 15 hours and 45 minutes, terminal-to-terminal.) Mark II had given us elegant transportation for \$19.53 worth of high-test fuel.

Our overall average speed was 49.7 m.p.h., including one hour and 47 minutes for necessary stops.

*If only.* There was only one thing that bothered us as we navigated our stately vessel toward Times Square. Mark II was still eager; Lockett still had a roll of film left; I was feeling perfectly fresh. If we'd realized that, we could have left Chicago that dawn! **END**



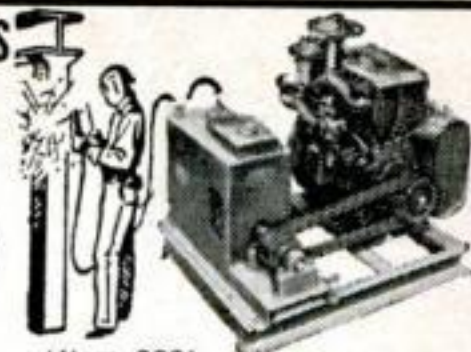
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Built in our own factory these big, industrial capacity, portable welders provide terrific performance, yet are sold direct-to-you at bedrock factory prices—hundreds of dollars less than you'd expect! Senior model (shown at right) has high capacity DC welding unit—easily, welds any thing up to 2" plate using 1/16" to 1/4" rods. Built-in stabilizer and cooling system makes arc easy to strike and hold. Dual control rheostat provides low heat soldering, brazing, and welding from 30 to 300 amps. Comes complete with instructions, guarantee and triple V-belt or flat pulley. Easy to hook up and easy to operate.

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MASTER**



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**WELDER ONLY—DUAL CONTROL MODEL.** Same as above, but drive with your tractor, jeep or gas engine of 14 HP or more. (Item 38a.) Wt. 100 lbs. \$450.00 value. . . .

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**COMPLETE POWER MASTER** (Illustrated above) powered by a 14.6 HP air cooled Wisconsin engine. Wt. 480 lbs. Item 280. Welder has ceramic rotary control with 74 heat settings. Factory special. . . .

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115 v. 60 cye. AC Powered by a rugged 2.2 HP easy starting Briggs engine. No wiring necessary; just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc., which require up to 700 watts. Ideal for television and radios. Complete with voltmeter and built-in winding to charge 6 v. auto batteries. (Item 24) Wt. 75 lbs. Easily fits in car trunk. Be prepared if storm knocks out power line. Regular \$275.00 value. . . .

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Generator only and control box. . . .

**\$169.50**

**DUAL VOLTAGE** 110-220 available on any of above models for \$28.00 additional.

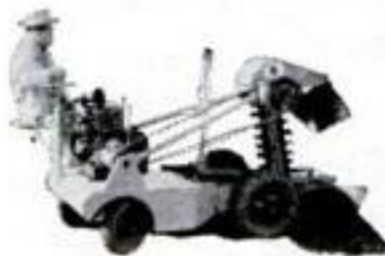
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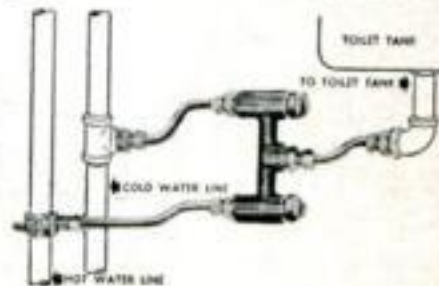
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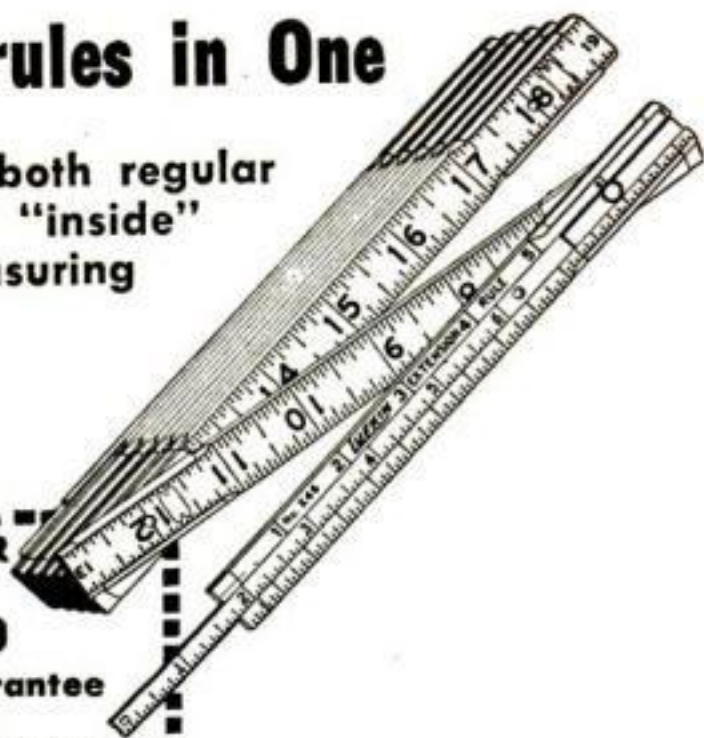
THE ELECTRONICS DIVISION OF GENERAL MOTORS

AUGUST 1956 233



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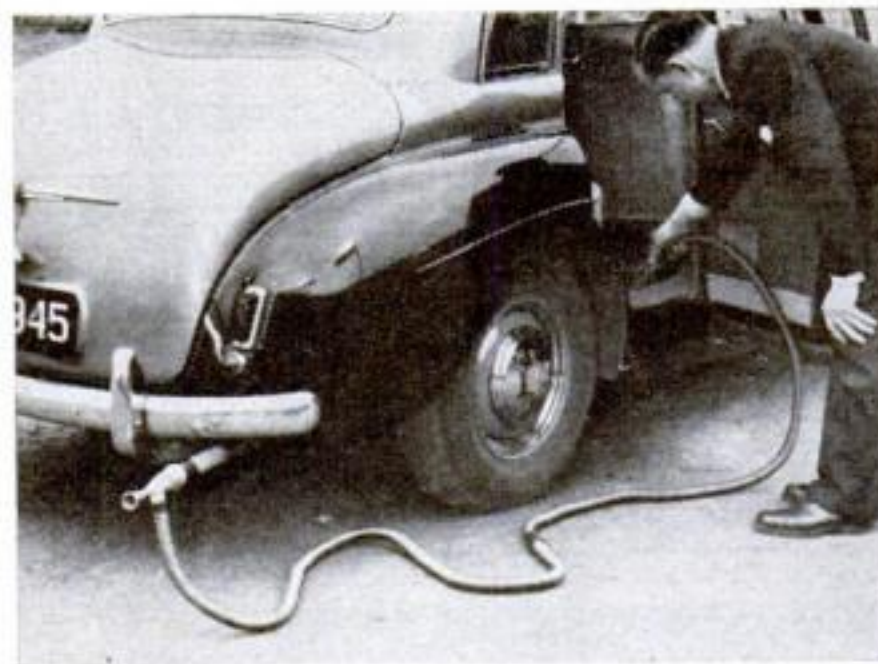
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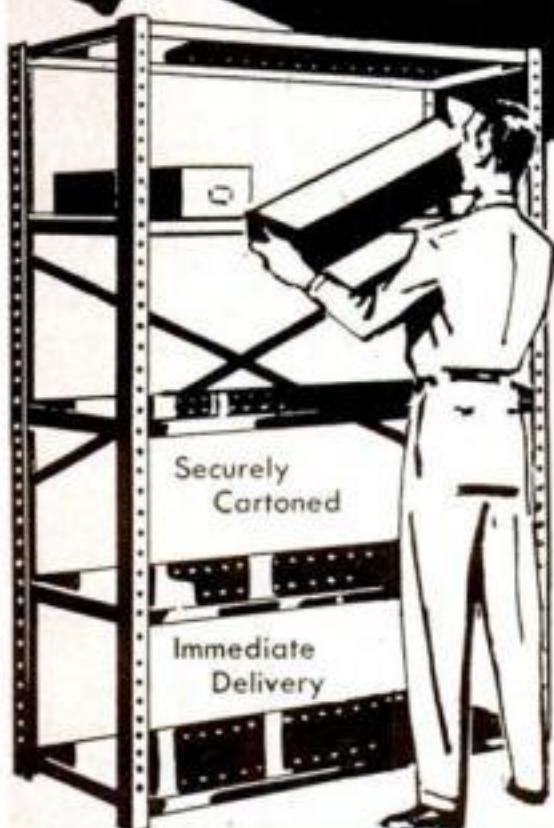
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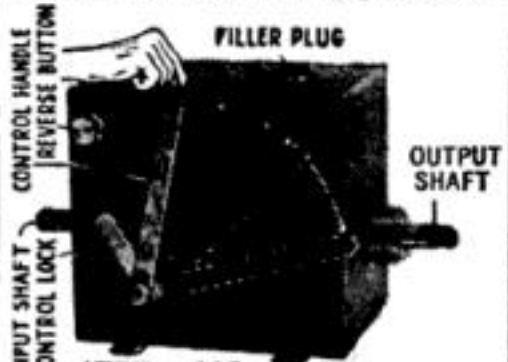
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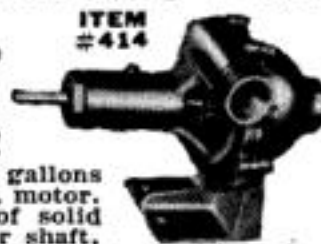
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Dimensions 12"x7"x8"

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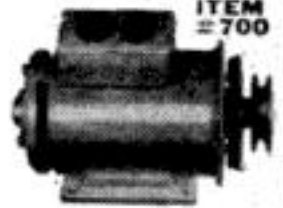
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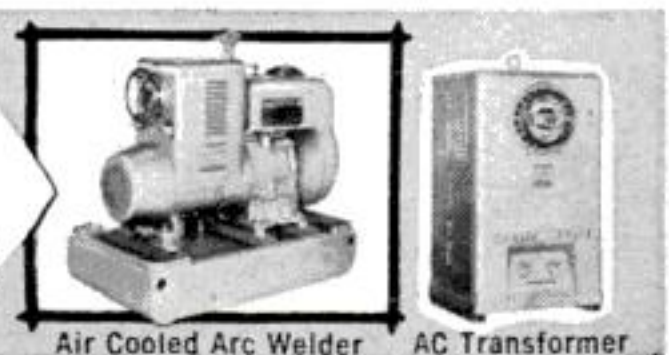
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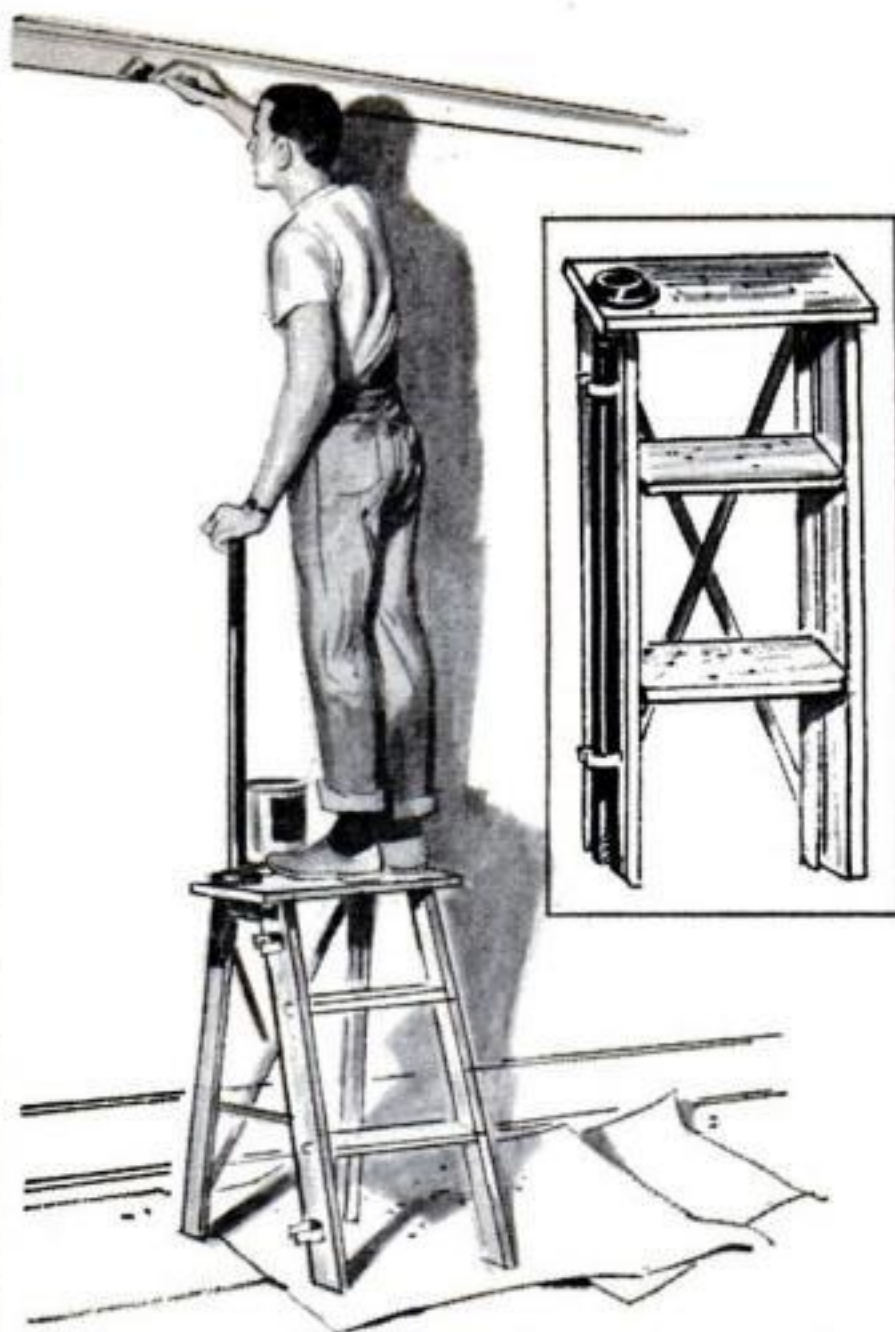
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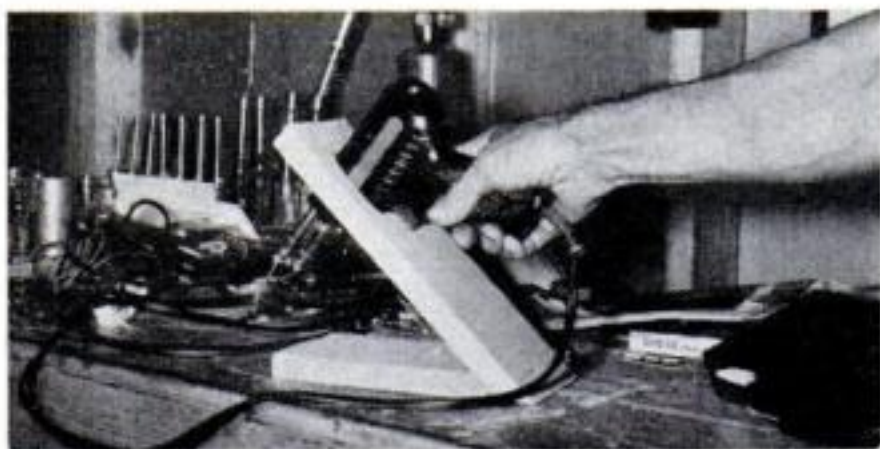
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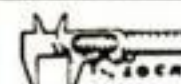
SUPPORTED in this stand, a soldering gun will always be ready for use when you need it. Make the stand of two pieces of 1" board, slotting one to take the soldering gun. Put a 45-degree bevel on one end of each piece and screw together.

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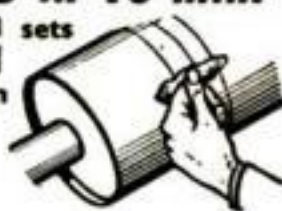
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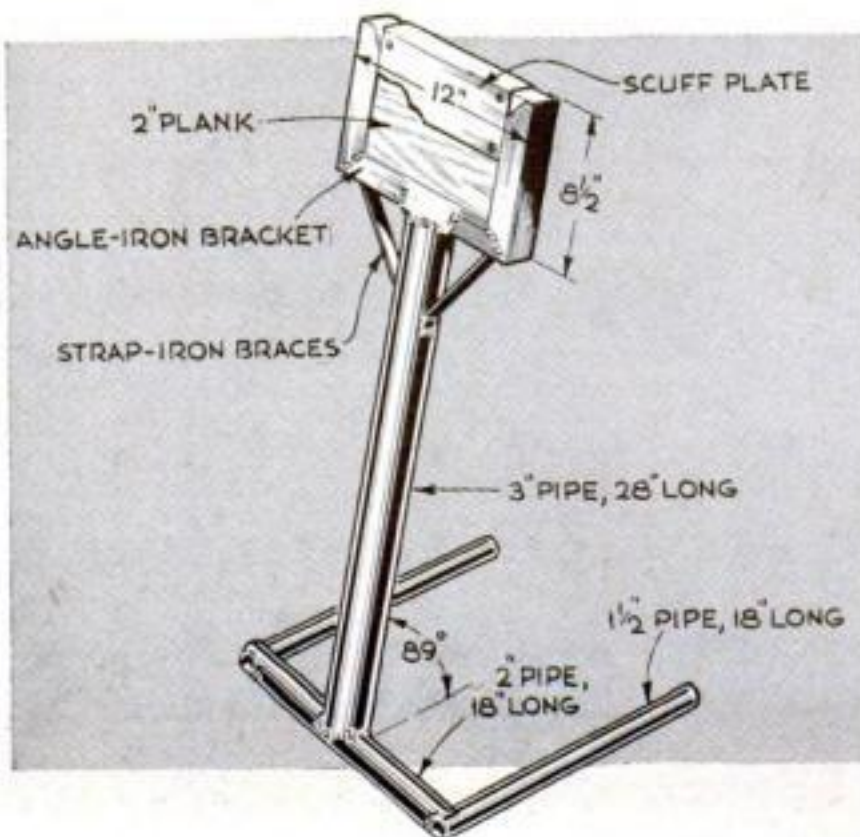
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ELECTRICALLY HEATED  
A Wm. Schwelge Product  
**Oil RE-REFINING Filter**  
Super-Efficient Filtration  
for TODAY'S Car-Truck-Tractor Engines  
Folder with full details FREE.  
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**NEW BENJAMIN SUPER CO<sub>2</sub> GAS CARBINE — \$16.50**

HI-LO (2 Stage) Jet Power  
Cal. .177 or .22  
RIFLED  
Shoots  
Pellets  
& Darts



IDEAL FOR  
TARGET & SMALL GAME

SAFE — ECONOMICAL — ACCURATE  
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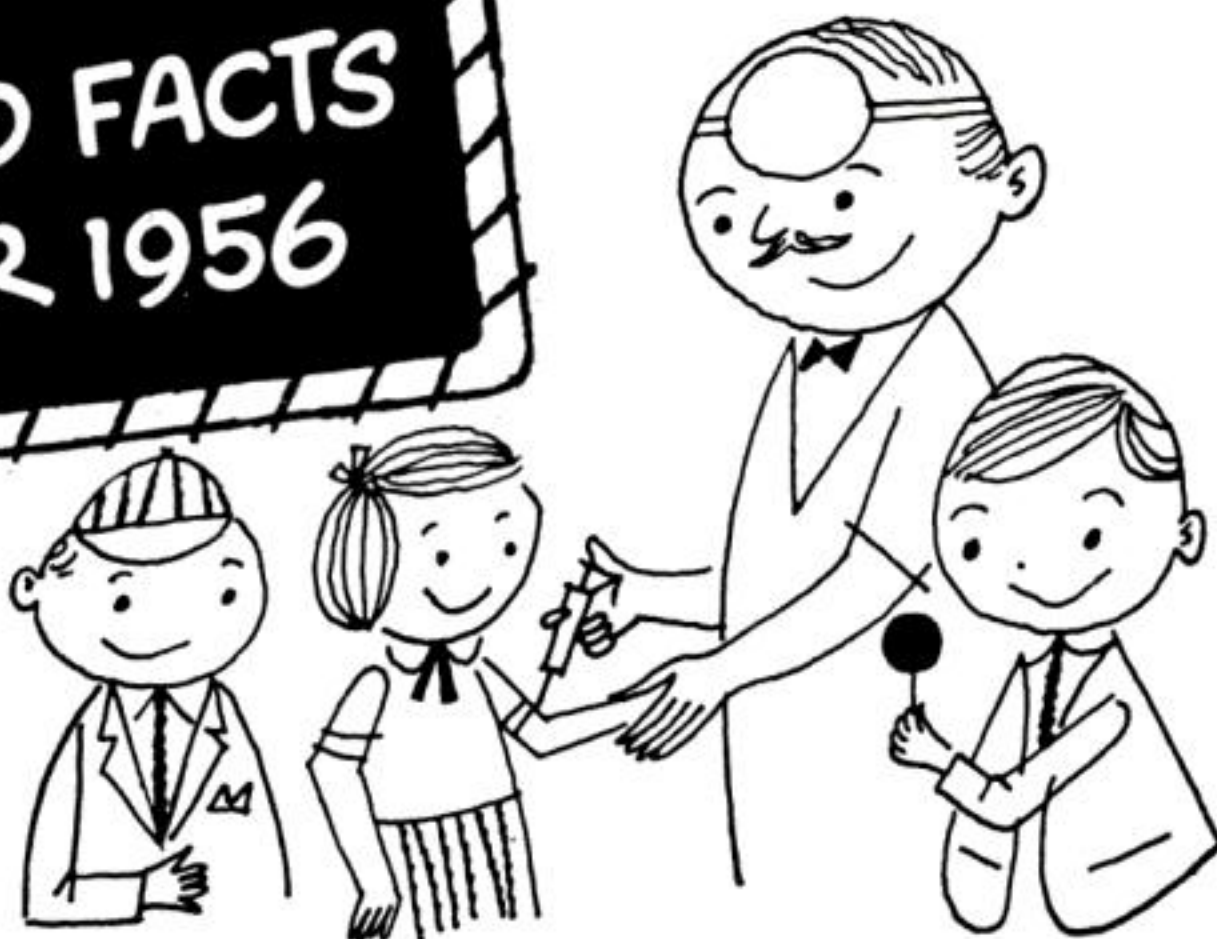
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Get 40 SHOTS from each 10¢ STANDARD SIZE CO<sub>2</sub>  
(Soda) CARTRIDGE. Up to 3/4" penetration.  
Ask your DEALER for DEMONSTRATION.

New Benjamin .177 or  
.22 CO<sub>2</sub> ROCKET Gas  
Pistol with HI-LO JET  
POWER..... \$15.00

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**THE NATIONAL FOUNDATION FOR INFANTILE PARALYSIS**

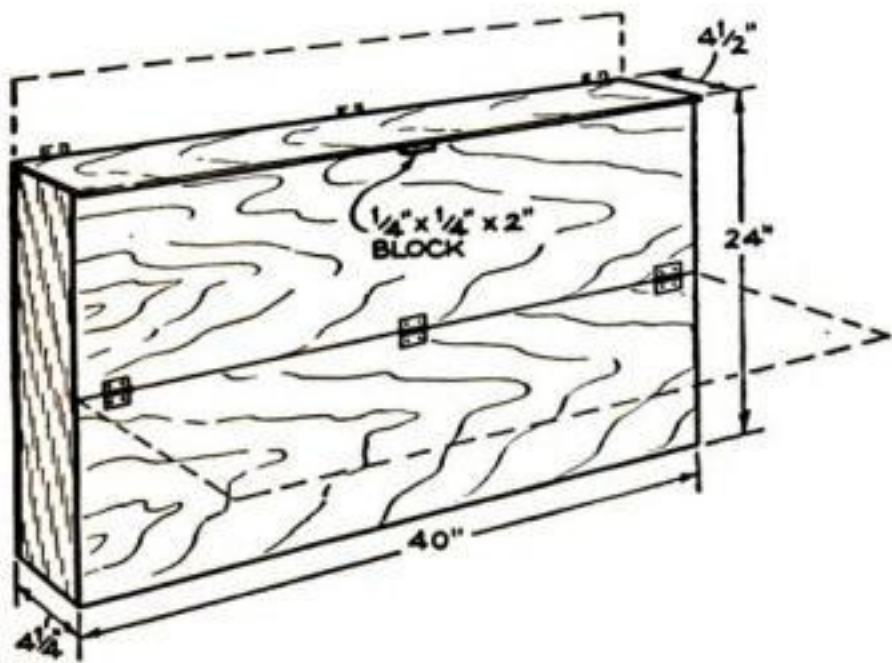
AUGUST 1956 239





### Junk Part Makes Saw Stand

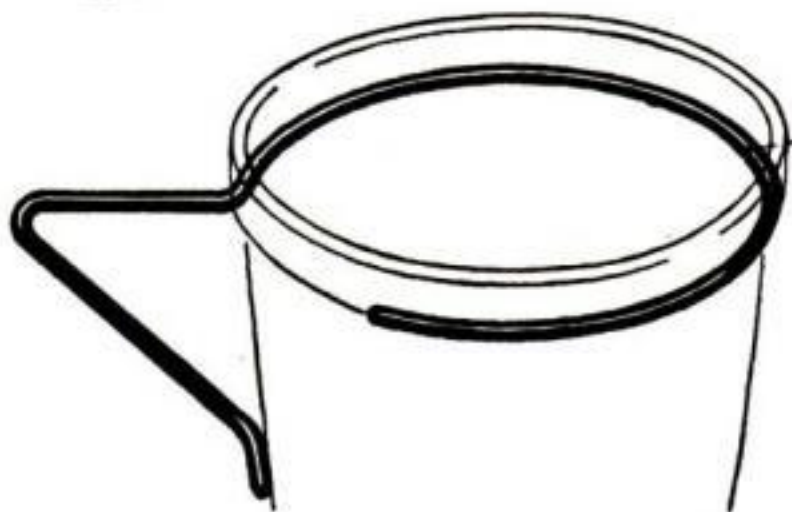
THE cast-iron base of an old cream separator is a natural for a stand for a table saw or other tool. It's already drilled, making it simple to bolt on stringers for mounting the tool. The one shown came from a junk yard. A stand from an old pot-belly or laundry stove would serve the purpose as well. Brace the extension table with a diagonal post fastened to each stringer.



### Small Cabinet Opens Wide

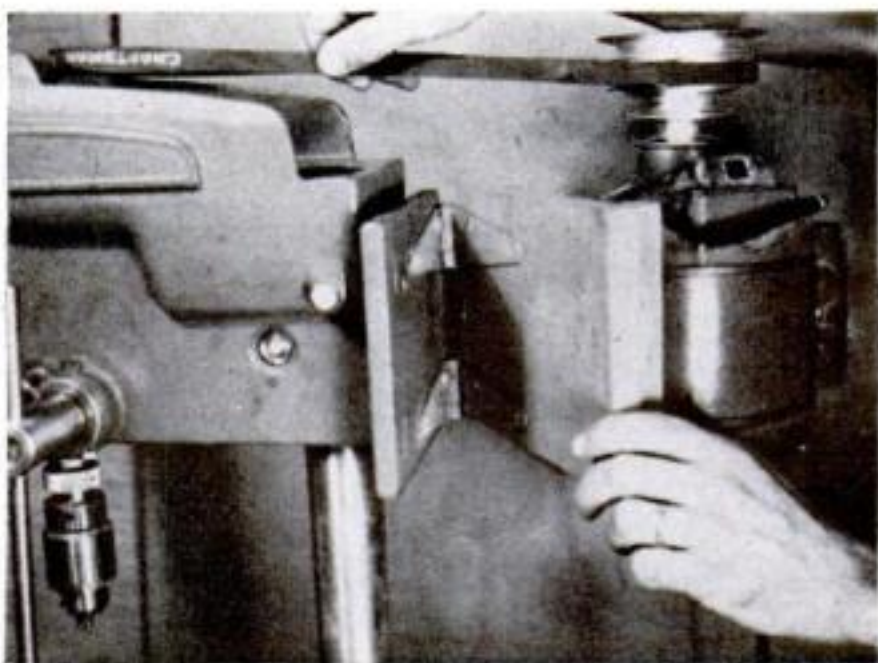
I BUILT a handy cabinet for plans, layouts and drawing paper by nailing  $\frac{3}{4}$ " plywood to end pieces cut from  $\frac{3}{4}$ " shipping-crate stock. The lid and top half of the front are hinged, as shown in the drawing, making it easy to get at small pieces in the bottom. A block on the lid lip holds the front shut.—*Gustave Nepper, Cincinnati.*

240 POPULAR SCIENCE



### How to Bend a Hot-Cup Handle

KEEP this handle handy in a lunch box to hold the vacuum-bottle cup when it's filled with a hot drink. Bend a length of 10- to 14-gauge wire as shown to fit under the cup lip.—*P. Casperson, El Cajon, Calif.*



### Mount Releases Pulley Belt

A HINGED motor mount provides a quick way to slacken a belt when changing speeds on a drill press. You can make one out of two pieces of  $\frac{3}{4}$ " plywood hinged with heavy strap hinges and bolted to the motor and pad. Insert a wedge or a couple of strong springs, such as auto-engine valve springs, between the leaves to get belt tension.



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WAR SURPLUS  
EXCESS INVENTORY  
BANKRUPT STOCK

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- AC Electric Buzzer (110-v)...64c
- AC Electric Bell (110-v)...79c
- Army Power Plant, 3000-w, 115-v...\$349.50
- Army Power Plant, 1000-w, 115-v...\$169.50
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- GE Amplifier, Rectifier, 110-v (\$175)...\$6.97
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### GIANT FRESNEL FLOODLIGHT

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Always ready when needed—seven most popular socket screw wrenches in one convenient tool, sizes .050 to 3/16. Fits set screws from No. 3 to 3/8—cap screws from No. 1 to 1/4. In handy plastic case. . . . **\$1.25** post paid



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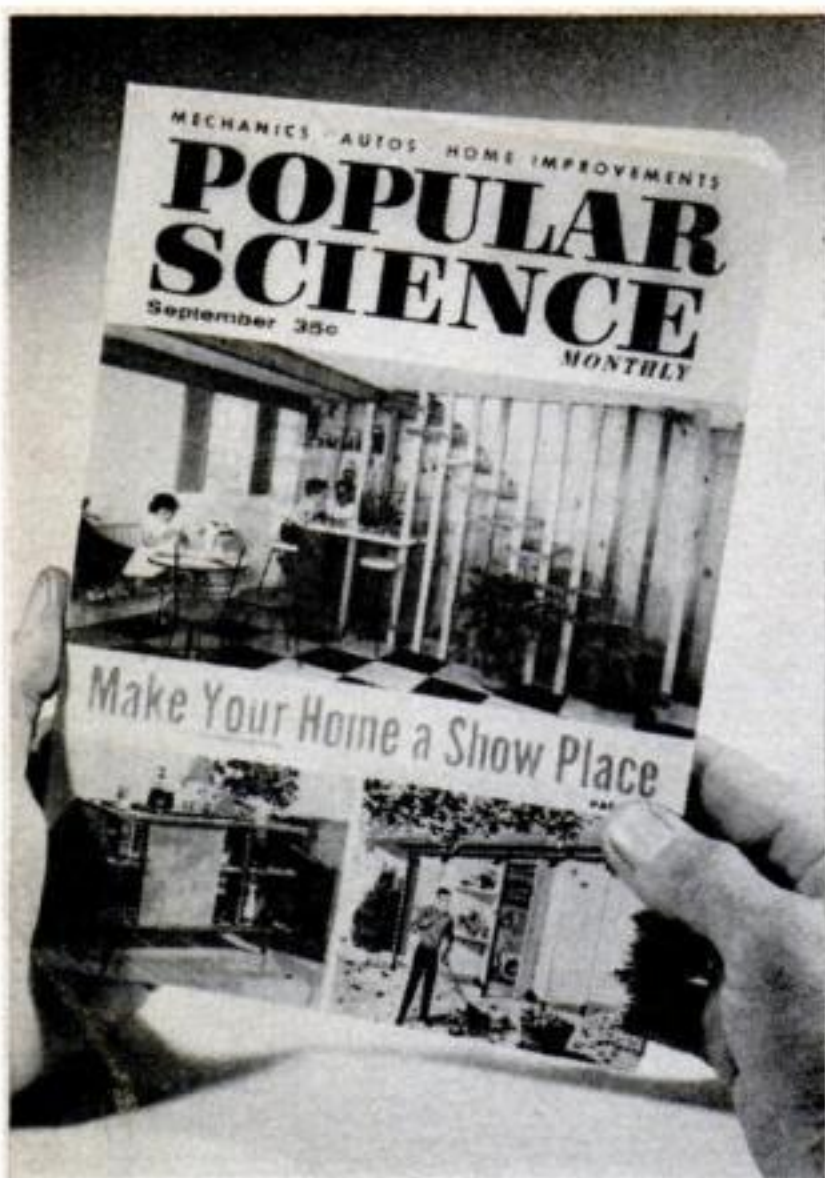
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**NEXT MONTH . . .**

*Don't miss the*  
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*on how to*  
**Make Your Home a Show Place**

YOU'LL certainly want to learn about a brand-new type of stairway, handsome and modern in concept, just right for you to build into a basement game room with your own hands . . . or specify for the living room of a home that is still in the planning stage.

And that's just one of the many practical home-improvement ideas that you will find in the September issue of POPULAR SCIENCE MONTHLY . . . all with easy-to-follow construction drawings and instructions . . . all jobs that you can do yourself . . . in a special 40-page section, with many striking full-color illustrations.

There are *plenty* of good ideas in it—ideas that have been rounded up by PSM editors especially for you.

**Why a Wife Says "No"**

*[Continued from page 115]*

some wives to avoid sex. Here, even if an effective birth-control method is ruled out, it is still helpful for husband and wife to face their problem realistically. If they can arrive at a mutual understanding, the wife doesn't have to invent all kinds of alibis for refusing her husband's attentions.

Misconceptions about what is abnormal and what is normal send many couples to marriage counselors. Divorce lawyers see a lot of them, too. Before taking a case to court, attorney Morris Ernst always tries to see if the marriage can be saved. Sometimes a wife needs only the reassurance that her husband is not "depraved" to give her marriage a second chance. "What people do in the privacy of their own bedrooms is their own business so long as they are not hurting anyone else," says Ernst.

"I always feel as if Mother and all the neighbors back home were watching everything that goes on." That's how one wife explained the guilt feelings that took all the joy out of her relations with her husband.

**"Too many people in the bedroom"** is at the bottom of many such difficulties. These aren't real people, of course, but images that wives, and husbands, too, carry about in their minds. For the most part they represent childhood authority figures—father, mother, teachers, and others who laid down the law on sex and enforced it with punishments if their "laws" were broken.

These tabus may have worked all right in childhood, but some of them cause trouble in adult life. Because girls are brought up more strictly than boys, wives are likely to be more hampered than their husbands by guilt feelings.

There are many reasons why wives say no and their husbands resent it. But there are few serious conflicts that couldn't be avoided on this score if both husband and wife were concerned only with satisfying each other in this fundamental relationship, to the exclusion of everybody else in the world. **END**



This One



KJ13-2BP-P92L







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A one quart canteen and aluminum cup fit into the insulated canvas cover. Choice of web type pistol belt or cartridge belt with pockets. The canteen is new Korean War Surplus. **259**

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Finest quality pre-formed cable. Extra flexible - rust and corrosion resistant. Aircraft quality. 7 x 19 strand.

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5/32"	2800 lbs.	21¢
3/16"	3900 lbs.	23¢
7/32"	5000 lbs.	29¢
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The manpower shortage is over now. The chips are down. Now a man has to *prove* he's got it on the ball before the really *good* jobs are open to him.

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A lot of potentially good men are feeling the pinch. They're working, sure, but they're just not getting anywhere. And almost to a man, it can be traced to just one thing: not enough training.

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If you haven't received a worthwhile raise within the past six months, if you had to take a back seat while others moved ahead—then the time for wishing and waiting is over. You've got to act. And that's where I. C. S. comes in.

## I.C.S. LETS YOU EARN WHILE YOU LEARN

In your spare time, I. C. S. gives you the training you need to get



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  - ☐ Chemical Engineering
  - ☐ Chem. Lab. Technician
  - ☐ General Chemistry
  - ☐ Natural Gas Prod. & Trans.
  - ☐ Petroleum Engineering
  - ☐ Plastics
  - ☐ Pulp and Paper Making

- CIVIL, STRUCTURAL ENGINEERING**
- ☐ Civil Engineering
  - ☐ Construction Engineering
  - ☐ Highway Engineering
  - ☐ Reading Struct. Blueprints
  - ☐ Sanitary Engineering
  - ☐ Structural Engineering
  - ☐ Surveying and Mapping
- DRAFTING**
- ☐ Aircraft Drafting
  - ☐ Architectural Drafting
  - ☐ Electrical Drafting
  - ☐ Mechanical Drafting
  - ☐ Mine Surveying and Mapping
  - ☐ Plumbing Drawing and Estimating
  - ☐ Structural Drafting
- ELECTRICAL**
- ☐ Electrical Engineering
  - ☐ Electrical Maintenance
  - ☐ Electrician
  - ☐ Contracting
  - ☐ Lineman
- HIGH SCHOOL**
- ☐ Commercial
  - ☐ Good English
  - ☐ High School Subjects
  - ☐ Mathematics

- LEADERSHIP**
- ☐ Foremanship
  - ☐ Industrial Supervision
  - ☐ Leadership and Organization
  - ☐ Personnel-Labor Relations
- MECHANICAL AND SHOP**
- ☐ Gas—Electric Welding
  - ☐ Heat Treatment
  - ☐ Metallurgy
  - ☐ Industrial Engineering
  - ☐ Industrial Instrumentation
  - ☐ Industrial Supervision
  - ☐ Internal Combustion Engines
  - ☐ Machine Design-Drafting
  - ☐ Machine Shop Inspection
  - ☐ Machine Shop Practice
  - ☐ Mechanical Engineering
  - ☐ Quality Control
  - ☐ Reading Shop Blueprints
  - ☐ Refrigeration
  - ☐ Sheet Metal Worker
  - ☐ Tool Design
  - ☐ Toolmaking
- RADIO, TELEVISION**
- ☐ Industrial Electronics
  - ☐ Practical Radio TV Eng'ng
  - ☐ Radio and TV Servicing
  - ☐ Radio Operating

- ☐ Television Technician
- RAILROAD**
- ☐ Air Brake Equipment
  - ☐ Car Inspector
  - ☐ Diesel Engineer & Fireman
  - ☐ Section Foreman
- STEAM AND DIESEL POWER**
- ☐ Combustion Engineering
  - ☐ Diesel—Elec.
  - ☐ Diesel Eng's
  - ☐ Electric Light and Power
  - ☐ Stationary Fireman
  - ☐ Stationary Steam Engineering
- TEXTILE**
- ☐ Carding and Spinning
  - ☐ Cotton, Rayon, Woolen Mfg.
  - ☐ Finishing and Dyeing
  - ☐ Loom Fix'g
  - ☐ Textile Des'ing
  - ☐ Textile Eng'g
  - ☐ Throwing
  - ☐ Warping and Weaving
- MISCELLANEOUS**
- ☐ Domestic Refrigeration
  - ☐ Marine Engineering
  - ☐ Ocean Navigation
  - ☐ Professional Engineering
  - ☐ Short Story Writing
  - ☐ Telephony

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(And

### ALFRED WALLENSTEIN

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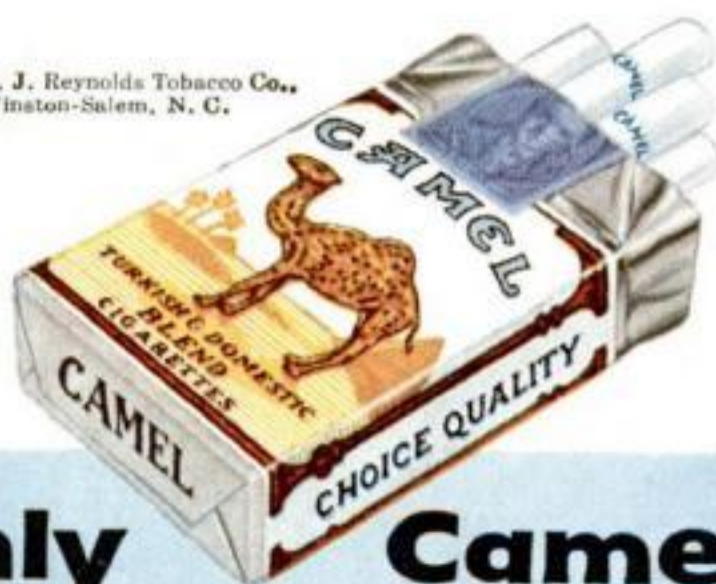


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